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Productivity and Efficiency in Community Colleges: The Use of Cost-Effectiveness Analysis to Increase Student Success

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Productivity and Efficiency in Community Colleges: The Use of Cost-Effectiveness Analysis to Increase Student Success

by

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

December 2019

Dedication

To my children: Rebecca, Greg, Rachel, and Jennifer.

Acknowledgements

I am deeply grateful to my committee members: Dr. Victor Saenz, Dr. Edwin Sharpe, Dr. Richard Reddick, and Dr. Evelyn Waiwaiole. Their consistent and continued support, guidance, and input throughout this process made the completion of this dissertation possible. I was also fortunate to benefit from their expertise in classes and internships throughout this doctoral program - thank-you!

I greatly appreciate each of the participants in this study; their willingness to share their time, experience, and expertise made this study possible. I also want to thank Dr. Henry Levin, Dr. Clive Belfield, Dr. Brooks Bowden, and Dr. Robert Shand for allowing me to observe the Center for Benefit-Cost Studies of Education Methods Training Course. The training and experiences they provided in the course were invaluable to this research.

I want to thank Dr. Barbara Mink for her encouragement, the guidance she provided to our cohort, and for opportunities that deepened our understanding of community colleges. To my cohort colleagues, thank-you for your friendship, your insights, and your enthusiasm for the promise of education. Your dedication is an inspiration in my life, and in the lives of so many students.

And to my family, thank-you for everything! To my sister Marcie, thank-you for your love, support, and constant encouragement. To my children, thank-you for being who you are, for always cheering me on, and for sharing this life with me. You amaze me every day.

Abstract

Productivity and Efficiency in Community Colleges: The Use of Cost-Effectiveness Analysis to Increase Student Success

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The University of Texas at Austin, 2019

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This two-part qualitative study explored the use of cost-effectiveness analysis (CEA) in community colleges. CEA is a cost analysis tool that compares alternative programs, designed for the same outcome, in terms of both costs and effects, ranking programs by cost-effectiveness and providing more information to decision makers than cost data or effectiveness data alone. CEA indicates which program provides the greatest benefit at the lowest cost, or the greatest return in student outcomes for a fixed investment. The purpose of the study was to determine if CEA methodology could be used by individual colleges and how CEA might fit into their decision-making process. The literature review revealed few CEA studies of community college programs; the only published studies were conducted by external researchers, and no studies identified how CEA methodology could be adapted for institutional use.

Part One investigated what is required for CEA to be implemented by individual colleges, challenges that might arise, and potential solutions. Unstructured and semi-structured interviews were conducted with eleven participants who had expertise in CEA, institutional research, and data analytics. Results of Part One revealed that CEA can be adapted for institutional use, and identified the requisite competencies and resources. Part Two used a grounded theory approach to explore how college leaders work to increase student success. Findings from twenty-six unstructured interviews with community college executive leaders facilitated proposal of a substantive grounded theory describing how leaders align campus culture, programs, and processes to a student success mission. Findings also suggested leadership interest in CEA, and a niche for CEA within the theory.

CEA is seldom utilized in higher education. Community colleges focus on the use of program effectiveness data to improve student outcomes, overlooking the strategic use of program cost data to increase student success. The findings of this study indicate that CEA methodology can be adapted for use by individual community colleges, and identify a role for CEA in decision making. This study also provides an introductory guide for colleges interested in using CEA.

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Chapter One: Introduction

Community colleges are under unprecedented pressure to improve student outcomes and graduation rates. Rapidly changing national demographics and potentially unmet future workforce needs underscore the critical importance of an educated citizenry. In addition, a national completion agenda and the growing use of performance funding place community colleges in the spotlight – a spotlight of high expectations seldom accompanied by additional funding.

In response, colleges are exploring strategies to improve student outcomes and implementing student success programs that are often highly resource dependent. Programs may require no new funding, a significant reallocation of funds, or a large input of new resources. In addition, colleges often implement pilot programs without adequate consideration of long-term sustainability. Few colleges adequately measure or anticipate costs, connect spending to performance, or take steps to ensure they are providing students with the most effective programs possible with the limited resources available.

In addition, public stakeholders do not require fiscal accountability outside traditional accounting reports. Despite national, state, and local pressures to produce more graduates for the public's investment, postsecondary institutions have not been asked to demonstrate how institutional spending relates to student success. This critical connection is seldom explored by policy makers or college personnel. Paul Lingenfelter, past president of the State Higher Education Executive Officers, noted that when education is a priority it is fair to ask "are we spending money well…is our spending

productive?" (Lingenfelter, 2006, p. 342). However, reflecting on the relative absence of cost analysis in higher education, researchers Douglas Harris and Sara Goldrick-Rab observed "How would you know whether you're spending money effectively if you've never even asked the question?" (National Research Council, 2012b, p. 16).

Questions about the relationship between efficiency and effectiveness can be answered with cost analysis tools, however these tools are seldom used in higher education despite their common application in healthcare and other fields. Cost-effectiveness analysis (CEA) is a form of cost analysis particularly well suited to community college needs. It allows decision makers to select among competing alternatives those programs that maximize student outcomes for a specific investment, or achieve a desired level of student success for the lowest cost. Currently most postsecondary program evaluation focuses solely on program effectiveness. CEA, however, considers both effectiveness and cost – combining inputs and outputs to reveal a broader picture than either effectiveness or cost alone. In an environment of high public expectations, increasingly underprepared students, and constrained budgets, CEA can be a valuable tool for college leadership to guide decision making and resource allocations.

This study sought to understand how community college leaders connect spending to results, how they perceive CEA and its role in student success efforts, and potential challenges and solutions to the use of CEA in community colleges. As described in later sections, some aspects of this original intent were modified in response to the data, and in accordance with the tenets of grounded theory methodology.

Statement of the Problem

Community colleges in the 21st century struggle to satisfy potentially conflicting demands – produce more graduates, serve growing numbers of underprepared students, and do both with limited resources. In addition, states are enforcing accountability through policy levers such as performance based funding. This environment is further complicated by the relative absence of cost data that could support the most effective and efficient allocation of resources, allowing colleges to maximize productivity within financial constraints.

Produce More Graduates

Growth in the US economy is greatest in industries requiring an educated workforce (Carnevale, Smith, & Strohl, 2010). The number of postsecondary graduates, however, is insufficient to meet future labor demands. Unless current trends are reversed, U.S. educational attainment will fall behind that of most developed countries by 2025 (Wellman, 2010b). Colleges will not produce enough healthcare workers, teachers, or industry and technical specialists to fill positions vacated by retiring workers (Boggs, 2012). The current production of graduates is particularly inadequate to meet future workforce needs in STEM disciplines (Wellman, 2006).

In response, the Obama administration announced the 2009 American Graduation Initiative, aspiring to lead the world in college graduates by 2020 (Obama, 2009). Influential foundations also set ambitious goals. The Lumina Foundation's GOAL 2025 set a target of 16.4 million more college graduates by 2025, increasing the number of Americans with a postsecondary credential to 60% (The Lumina Foundation, 2017). The

Bill & Melinda Gates Foundation also works to promote student success, with specific goals to increase the graduation rates of low income students (Bill & Melinda Gates Foundation, 2016). In addition, colleges across the nation pledge to prioritize completion and implement "aggressive" action plans (Complete College America, 2017). These ambitious programs are supported by policy advocacy, calls for increased data sharing, and recommendations for the use of financial incentives in which funding is predicated on performance. Interestingly, little or no mention is made of evaluating how, and in what ways, performance is affected by funding (i.e., institutional expenditures). Absent are suggestions that institutions and states work to demonstrate how institutional spending impacts student outcomes, despite the fact that such a practice could guide both college leaders and policy makers in making and evaluating productive investments in student success.

Serve Growing Numbers of Underprepared Students

Much of the responsibility for increasing college completions falls on community colleges - institutions that award both associate degrees and short- and long-term certificates. Public two-year colleges are also the primary postsecondary entrance point for disadvantaged populations, including Hispanic, African American, and low socioeconomic status (SES) students, that often require intensive support (Lingenfelter, 2006; Shapiro et al., 2015). The challenges are even greater when a student is the first in their family to attend college (Duckworth, White, Matteucci, Shearer, & Gross, 2016). Callan (2002) noted that postsecondary students in the opening decades of the 21st

century will be “the most heterogeneous - and the poorest - ever to seek higher education” (p. 6).

According to demographic trends, the student groups most at risk for low academic success are also those that are increasing most dramatically (Levin & Garcia, 2012). In addition to forming a large segment of the higher education pipeline, traditionally underserved populations will make up the majority of the nation’s future workforce. Current patterns predict the U.S. will have a minority majority by 2060 (Lopez, 2006). These trends present opportunities, and challenges, for community colleges operating at pre-recession funding levels and struggling to provide costly student support services (Askin, 2007; Schneider & Yin, 2012; Zumeta, 2004). Wellman (2008) advised that meeting ambitious graduation goals wouldn’t be possible unless achievement gaps were closed, and closing achievement gaps would only be possible if “we make improvement in student success our highest fiscal priority” (p. 22).

Succeed with Limited Resources

Public funding for higher education declined in the 21st century. State higher education appropriations fell from 44% of total revenue in 1980 to 22% in 2009, leading some college leaders to view their institutions as “state assisted” rather than “state supported” (Belfield & Jenkins, 2014; Hossler, 2004). Community colleges are particularly vulnerable to declines in public funding; they depend more on state and local funding than their four-year counterparts, and have fewer supplementary revenue sources (Baum & Kurose, 2013). They also have limited ability to raise tuition in response to funding shortfalls (St. John & Parsons, 2004b; Wattenbarger, 1994).

In the 2000s, total community college revenues decreased by 10% (Belfield, 2015b). While public research institutions reported a 2% increase in average educational spending per FTE from 2002 to 2006, public two-year institutions reported a 29% decrease over the same time period (Wellman, 2008). Expectations from public stakeholders for improved student outcomes, however, continued to rise. Accountability efforts expanded, as reflected in revised higher education funding formulae and institutional report cards such as the Voluntary Framework of Accountability (American Association of Community Colleges, 2012; Dougherty et al., 2014b). Colleges can and should be held accountable for performance and productivity, but reports must be carefully interpreted and can be misleading when institutional effectiveness is emphasized while cost information is absent or incomplete.

Unfortunately, while there is a growing body of evidence for effective practices, there is little corresponding research on program costs (Hollands et al., 2014). The omission of cost data in higher education decision making means there "is almost no direct evidence to support – on efficiency grounds – the many educational interventions or reforms now being proposed for implementation" (Levin & Belfield, 2015). Without considering both effectiveness and costs, colleges will not be able to respond to 21st century demands. The nation's postsecondary graduation targets require more than a threefold annual increase in the number of community college credentials awarded. This would be difficult even with well-prepared students and generous funding; community colleges have neither (Bailey, 2012; Lingenfelter, 2006). Increasing student success will

require policymakers, decision makers, and college leadership to alter the framework for higher education fiscal accountability.

Cost-Effectiveness Analysis: A Potential Solution

At the intersection of these 21st century challenges – increase the number of graduates, serve growing numbers of underprepared students, and succeed with limited resources - lies a potential solution: cost-effectiveness analysis. Cost-effectiveness analysis (CEA) is a cost analysis tool that compares two or more alternative programs, designed to achieve the same outcomes, in terms of both effectiveness and cost. The results indicate which program will deliver a particular benefit at the lowest cost, or which predetermined investment will provide the greatest benefit.

Introduction to Cost-Effectiveness Analysis

CEA was developed in the 1950s and 1960s for the evaluation and selection of weapons systems (Levin, 2015). The economic realities referenced in the 1965 publication *The Economics of Defense in the Nuclear Age* are familiar to higher education fifty years later: "Resource limitations are our starting point because in all problems of choice we strive to get the most out of what we have" (Hitch & McKean, 1965, p. 23)

Dr. Henry Levin pioneered the use and development of CEA in educational evaluation. His research comparing the cost-effectiveness of hiring teachers with different qualifications was published in 1970, and found that it was five to ten times more cost-effective to employ sixth grade teachers with higher verbal scores than teachers with more experience (Levin, 1970). Five years later Dr. Levin authored a

chapter on the use of CEA for the social sciences in the 1975 *Handbook of Evaluation Research* (Guttentag & Struening, 1975). This was followed in 1983 with *Cost-Effectiveness: A Primer*, the first book outlining the method (Levin, 1983). A second edition was published in 2001 and a third edition in 2017 (Levin & McEwan, 2001; Levin, McEwan, Belfield, Bowden, & Shand, 2017). The term "cost effective" has been used in different ways by different researchers; cost-effectiveness analysis, as referenced in this study, refers to the definition and methodology developed by Dr. Henry Levin.

Cost-effectiveness analysis is founded in the economic concept of *opportunity cost.* The opportunity cost of an intervention is what "must be [given] up by not using these resources in some other way" (Levin & McEwan, 2001, p. 44). Briefly, identification of costs proceeds according to the *ingredients method* which identifies all resources required to implement an intervention. Resources include facilities, personnel, supplies, equipment, and other (ingredients that don't fit into a preassigned category). Costs are then assigned to each ingredient, multiplied by the quantity of the ingredient, and added to determine the total cost of a program (Levin & McEwan, 2001).

Because CEA incorporates both costs and effects, the effectiveness measures used should be carefully determined and designed. Effectiveness measures selected for program evaluation must be reliable (repeatedly produce similar results) and valid (accurately reflect the program objectives) (Levin & McEwan, 2001). If costs are accurately assessed, but effectiveness measures are vague or flawed, the quality of the CEA will be affected.

Cost data and effectiveness data are then combined to produce a cost-effectiveness ratio (CER). To calculate the CER, total program costs are divided by program effects, providing a cost per unit of effectiveness (Levin & McEwan, 2001). This tells decision makers, in comparing two alternative programs, how much effectiveness they can purchase for a specific investment or the lowest cost they can pay for a particular outcome.

Cost-Effectiveness Analysis in Higher Education in the 21st Century

Despite the availability of CEA techniques for more than 40 years, most educational program evaluations continue to measure effectiveness without consideration of costs (Hollands et al., 2014). When costs are mentioned, the references are usually vague and rhetorical (Clune, 2002). In practice, cost analysis is not a standard component of strategic budgeting in community colleges. However, interest in CEA has been growing among higher education advocates, economists, researchers, and practitioners. Since 2010, several colleges and higher education systems have commissioned CEA studies, and the Center for Benefit Cost Studies of Education began offering the first training program in cost analysis for educational researchers in February 2015 (Center for Benefit-Cost Studies of Education, 2017; Levin & Garcia, 2012). In exploring the role of CEA in higher education in the 21st century, it is helpful to consider the use of CEA in decision making, existing evidence on the added value of CEA in program evaluation, and potential challenges in using CEA in community colleges.

The use of CEA in decision making. The goal of CEA is to guide decision making. Inherent in CEA is the assumption that, in the absence of political or social

considerations, decision makers should select those programs that provide the greatest level of effectiveness for the lowest cost. When political or social considerations are preeminent, CEA can be used to illuminate the financial facts associated with a decision. CEA also promotes research-based recommendations in an era when policy choices are frequently driven by political and stakeholder pressures (St. John, Daun-Barnett, & Moronski-Chapman, 2013). The contribution of CEA to decision making and policy development was first described more than 40 years ago:

> …the conclusions of [cost-effectiveness] studies do not in themselves define a policy action. Rather they serve as useful – and, one would hope, potent – sources of information that must be combined with factors that have not been taken account of in the cost-effectiveness inquiry, in order to make public choices that are sensible, efficient, and equitable. In this context, cost-effectiveness analysis can be a powerful and productive ally. (Levin, 1975, p. 118)

While cost effectiveness should not be the only determinant in programmatic and resource allocation decisions, its absence may lead to misguided decision making and suboptimal results.

Evidence on the added value of CEA in program evaluation. Early studies of CEA in education involved K-12 programs, particularly elementary grades. A 1987 study of math and reading interventions in grades 2 through 6 revealed that use of outcomes data alone can be misleading. When programs were evaluated only in terms of improved math and reading performance, adult tutoring emerged as the most effective. In contrast,

when effect size and cost data were both considered, peer tutoring was shown to be the most cost-effective (Levin, Glass, & Meister, 1987).

The first rigorous study of CEA at a community college was published in 2010, and demonstrated that expensive programs can be cost-effective in terms of student success. The Accelerated Learning Program (ALP) at the Community College of Baltimore County was designed to improve completion of college level English courses. Despite being more expensive to implement than the traditional curriculum, it increased student completion of college level English at a savings of 6% (Jenkins, Speroni, Belfield, Jaggers, & Edgecomb, 2010).

The Accelerated Study in Associate Programs (ASAP) at the City University of New York (CUNY) is another example of an expensive program shown to be cost-effective. ASAP is a suite of services provided to students at six CUNY community colleges with the goal of increasing the number of students who graduate within three years by 50%. The additional cost of ASAP in 2007 averaged approximately $1.5 million per student cohort. However, the increase in three-year graduation rates due to ASAP resulted in an average savings of $6,400 per graduate and demonstrated that ASAP was more cost-effective than the traditional program (Levin & Garcia, 2012).

Challenges in using CEA in community colleges. The community college sector does not routinely consider cost effectiveness when recommending student success programs for implementation, continuation, or scale up. Possible explanations for this void include:

- Policymakers and college leaders are unfamiliar with CEA – what it can do and how it can support student success.
- Few agencies or institutions have staff with the expertise to perform CEA. Cost analysis training is not included in the curriculum of most higher education leadership programs, and few cost analysis training programs exist.
- Historical higher education accounting methods do not provide the data required for CEA.
- The metrics used to measure efficiency are often ambiguous and inconsistently applied.
- Legislatures do not require cost analysis, or that institutions demonstrate how spending is connected to outcomes.

In addition, "efficiency" has a negative connotation in many academic environments.

The concept of efficiency has not been uniformly embraced by the higher education sector. Academic communities may reject efficiency-based changes they perceive as endangering higher education's fundamental role as an intellectual enterprise, rationing educational services, or reinforcing economic stratifications (Gumport, 2000). Faculty often criticize what they view as the corporatization of higher education and express concern that prioritizing cost savings will negatively impact quality and access. However, fairness and efficiency are not incompatible values:

> Fairness is best served by the efficient and intentional allocation of resources – providing underserved populations with programs demonstrated to be effective, and calculated to provide the greatest good. Indeed, it would be unethical to

consciously substitute an avowed commitment to student success for a careful examination of the financial and programmatic realities. (Stewart, 2014, p. 20)

Rawls' (1971) theory of justice equates justice to fairness, and asserts that education should provide equal opportunities to all who are "similarly motivated and endowed" (p. 44). Community colleges serve diverse students with varying levels of motivation, preparation, and ability. While care must be exercised so that no student population is competing with others for resources, CEA can identify not only the most cost-effective programs, but also those that are most cost-effective for specific groups. The efficient allocation of resources, supported by CEA, promotes fairness among diverse populations by facilitating delivery of the most effective programs possible within an institution's financial constraints.

Purpose of the Study

The purpose of the study is to understand how CEA, and the strategic use of cost data, can be used by community colleges to increase student success. The study was conducted in two phases: Part One, and Part Two.

Part One

Part One explored the potential use of CEA in community colleges by investigating what is required to implement CEA, potential challenges in the use of CEA at the institutional level, and how these challenges can be addressed. In addition, due to the absence of extant research, Part One was important in establishing the feasibility of CEA use by individual community colleges before undertaking Part Two, which included exploring college leaders' perceptions of CEA.

Part Two

Part Two originally sought to use grounded theory methodology to understand how college leaders consider cost data in student success program decision making, and how CEA can contribute to the process. As discussed later in Chapter Five, the original goals of Part Two changed in response to interview data that revealed the main concern of college leaders was not strategic finance, but increasing student success, with little consideration of program costs outside cost feasibility. As a result, the purpose of Part Two evolved to developing a substantive theory explaining how college leaders work to increase student success. In addition, Part Two explored leaders' perceptions of CEA, where CEA might fit in the decision-making process, how it might contribute to student success efforts, and where and how it fit into the proposed grounded theory.

Part One provided the foundational research that helped to inform Part Two, while Part Two identified a niche for CEA in executive leaderships efforts to improve student success. The relationships that emerged between Part One findings and Part Two findings are discussed in Chapter Six.

Significance of the Study

This study contributes to the literature, and to practical student success efforts, by exploring how CEA can help college leaders connect spending to results at their institution, and how challenges to the use of CEA in community colleges can be addressed. CEA supports student success through comprehensive program evaluation and strategic budgeting. As a cost analysis tool, it supports institutional efficiency initiatives within a framework that prioritizes student success. However, despite CEA's widespread

use in healthcare and K-12 education, and the availability of the methodology for over four decades, it is not commonly used in higher education. The 2011 Institutional Survey, conducted by the Center for Community College Student Engagement, revealed that fewer than 7% of responding institutions indicated using any type of cost analysis in the evaluation of student success programs.

There are few studies applying CEA to community college programs, and no studies on how CEA could be added to the internal decision-making process at individual colleges, or the challenges involved. Researchers and CEA advocates propose that limited understanding of what CEA is, and what it can do, among college leadership and researchers contributes to the low institutional use of CEA (H. M. Levin, 2001). Scarcity of training programs, information costs, and technology challenges may also play a role. Exploratory research was needed to look more closely at this phenomenon.

Research Questions

Part One

Part One is an investigative study, designed to answer the following questions:

1. What is required for CEA to be implemented at community colleges?
2. What challenges exist at community colleges for the implementation and use of CEA?
3. How can these challenges be addressed?

Part Two

Part Two is a grounded theory study. In grounded theory methodology, the original research questions often change as data is gathered. The original research questions were:

1. How do community college leaders perceive - and if applicable, assess - the link between institutional spending and student success?

2. How do community college leaders perceive and pursue efficiency and effectiveness in student success programs?

3. How do community college leaders perceive CEA and its potential role in promoting efficiency and effectiveness in student success programs at their institutions?

Overview of Methodology

Part One was an investigative study. Purposive sampling was used to select participants with expertise in CEA methodology and research, as well as college leaders involved in institutional research and program evaluation. Data were gathered using unstructured and semi-structured interviews, which were then transcribed and coded.

Part Two utilized grounded theory methodology. Theoretical sampling was used to select participants; unstructured and semi-structured interviews were recorded and transcribed. Data were analyzed using the constant comparative method. Coding progressed from substantive to selective once the core category was identified. Theoretical coding was then used to develop the substantive theory.

Definition of Terms

Cost-effectiveness analysis: Cost-effectiveness analysis (CEA) is an evaluation technique that compares alternative programs in terms of both costs and effects. Both programs must have the same objectives. By combining cost data with effectiveness measures, CEA identifies student success strategies that "maximize outcomes for any given cost or produce a given outcome for the lowest cost" (Levin & Belfield, 2015, p. 2).

Cost-effectiveness ratio: A cost-effectiveness ratio is calculated by dividing total program costs by an effectiveness measure specific for that program. Programs with the lowest cost-effectiveness ratio are the most cost-effective.

Cost: Cost is what an institution spends to provide educational services. The cost of an intervention is the total value of all resources that are required to implement the intervention. This is based on the concept of opportunity cost; the cost of an intervention is what "must be [given] up by not using these resources in some other way" (Levin & McEwan, 2001, p. 44). For CEA, the cost of a program is determined by identifying all ingredients required for the program, assigning a cost to each ingredient, and multiplying the quantity of the ingredient by the cost.

Effectiveness: Effectiveness is how well a program achieves its outcomes. Measures of effectiveness used to calculate the cost-effectiveness ratio must be reliable and valid (Levin & McEwan, 2001).

Efficiency: In this study, efficiency is the fiscal cost per completion (Belfield, 2012). A program is efficient when it maximizes the output possible with a given quantity of inputs (National Research Council, 2012b).

Inputs: Inputs are the ingredients required for implementation of a program. For CEA, ingredient categories include facilities, equipment and materials, personnel, funds, and other (Levin & McEwan, 2001).

Outputs: Outputs are quantified outcomes produced by a program or intervention (e.g., the number of students who graduated with a credential).

Outcomes: Outcomes are the result, or goals, of a program or intervention (e.g., to increase the number of students who graduate with a credential).

Productivity: Productivity is "the quantity of outputs delivered per unit of input utilized" (National Research Council, 2012b, p. 19). An increase in productivity requires either an increase in output with no change in inputs, or a decrease in inputs with no change in outputs (Wellman, 2010a)

Limitations, Delimitations, and Assumptions

Limitations

Limitations are weaknesses in a study that the researcher cannot control. Limitations included:

- Participant response: Although a few CEA studies in community colleges have been published, the national focus on increasing student success through program effectiveness has not included equal discussions of program costs. Participants may not have been sufficiently aware of CEA

to discuss how it might fit into their decision-making process, or potential barriers to its use at their institutions.

- Lack of prior research: CEA is just beginning to receive attention in higher education. No studies on executive perceptions of CEA, or barriers to the use of CEA in community colleges, were found. As such, I may not have been aware of problems and perceptions relevant to this study.
- Sample size and locations: Sample size and locations were limited by time and resource constraints for both Part One and Part Two - these variables could impact the breadth and depth of saturation reached.

Delimitations

Delimitations are choices made by the researcher that place limits, boundaries, and constraints on a study. Part Two delimitations included:

- Methodology: I elected to do a grounded theory study for Part Two and develop a substantive theory. As such, the results of the study may not be generalizable to a broader population.
- Interpretation: Grounded theory is dependent on the researcher's interpretation. My background and experience - as a biologist, and as a community college faculty member and administrator - may have influenced my analysis of the data. My response to emergent themes may be different than that of another researcher analyzing the same data.

Assumptions

Upon beginning this study, CEA was assumed to be a valuable addition to community college student success efforts, as advocated by the Center for Benefit Cost Studies of Education, and demonstrated by extant studies at the City University of New York and the Community College of Baltimore County. In addition, it was assumed that CEA was seldom used in community colleges due to the paucity of published studies, the small number of institutional responses on the Center for Community College Student Engagement Institutional Survey indicating use of cost analysis, and personal communication with college leaders and researchers. It was also assumed that barriers to the use of CEA in community colleges could be addressed.

Organization of the Study

This study is organized in six chapters. Chapter One presented an introduction to the study, including a statement of the problem, the purpose and significance of the study, a statement of the research questions, and an overview of the methodology. Chapter Two reviews the literature pertaining to CEA, beginning with the evolution of 21st century conditions and demands that created a need for CEA. In addition, Chapter Two reviews the economic concepts of productivity and efficiency, and their application to higher education. Chapter Three describes the methodology selected for each part of the study. Chapters Four presents and discusses the findings for Part One, while Chapter Five presents and discusses the findings for Part Two. Lastly, Chapter Six summarizes each part of the study; offers recommendations for future research and practice; and discusses the significance of, and relationship between, Part One and Part Two.

Chapter Two: Literature Review

There is scant literature on cost-effectiveness analysis (CEA) in higher education. Despite the availability of CEA methodology for over 40 years, it is seldom used in higher education and few studies exist. However, the intersection of a national completion agenda with 21st century fiscal constraints created a political and academic environment that demands greater productivity and efficiency from community colleges. CEA is a valuable tool for decision makers in this environment. When used in the planning and evaluation of student success programs, it supports increased completion, effective investing in student outcomes, and improved institutional productivity and efficiency.

This chapter reviews the literature on CEA, as well as the forces that combined to create an urgent need for CEA in the 21st century. The literature review is divided into four sections: (a) evolution of the completion agenda, (b) community college funding, (c) productivity and efficiency in higher education, and (d) cost-effectiveness analysis. The first three sections review the foundational need for CEA. The fourth section reviews the literature on CEA - one of the most promising tools available to the higher education sector.

Evolution of the Completion Agenda

Three forces in community college development led to the evolution of the completion agenda: growth and mission of community colleges, the changing basis of higher education legitimacy, and an accountability movement.

Growth and Mission of Community Colleges

The first independent two-year college opened in 1901 when Joliet Junior College admitted its freshman class (Eells, 1931). The foundations of the two-year college movement, however, were laid decades earlier as prominent higher education leaders suggested that lower division coursework be removed from the university curriculum. By 1870, President Henry Tappan of the University of Michigan and President William Folwell of the University of Minnesota both advocated restricting university work to upper division courses and graduate studies. During subsequent years, Edmund J. James of the University of Illinois and David Starr Jordan of Stanford added their support to placing the responsibility for postsecondary freshman and sophomore coursework with secondary schools (A. M. Cohen & Brawer, 2008).

The first actual separation of lower division courses occurred at the University of Chicago in 1892 under President William Rainey Harper. Initially the freshman and sophomore years were part of the "Academic College" while the junior and senior years became the "University College" (Eells, 1931). Four years later the Academic College became the "Junior College". Eventually President Harper promoted an independent institution to fill the role of the Junior College. Over time these independent institutions came to be referred to as *community colleges*.

Scholars disagree on the social, political, and academic forces that contributed to the growth, expansion, and mission of the community college. As a "distinctly American invention", two-year colleges grew in response to equally distinctive American social and

political pressures (Ratcliff, 1994, p. 3). Cohen and Brawer (2008) attributed the evolution of community colleges to three primary forces

- industrialization;
- increased demands for access to postsecondary education; and
- a growing concern for social equity.

Scholars with a more critical perspective asserted that

- workforce training programs grew in response to a desire from private businesses to have their workers trained with public funds;
- universities supported the establishment of community colleges as way to divert less able students and maintain their elite status; and
- community colleges were established to maintain social stratifications, not to promote equity and upward mobilization (Brint & Karabel, 1991; Kuntz, Gildersleeve, & Pasque, 2011).

Regardless of the driving force behind community colleges, dramatic growth occurred throughout most of the 20th century as colleges strove to provide access to all who desired to enroll. In 1910, there were three public two-year colleges (Eells, 1931). Two decades later, there were 610, averaging 400 students each (A. M. Cohen & Brawer, 2008; Koos, 1924). While this was a significant increase, the greatest growth came after World War II with the impact of the G.I. Bill of 1944 and the President's Commission on Higher Education in 1947 (Gilbert & Heller, 2013). The commission's report emphasized equity and broad educational opportunities. Attendance by minority students climbed, and community colleges were heralded as a democratizing force in American society

(Dowd, 2003). Increased availability of financial aid in the late 1960s further facilitated increases in enrollment (Rendon & Valadez, 1994).

Rapid growth gave way to explosive growth during the 1960s. Bolstered by their access mission, new community colleges appeared at a rate greater than one per week and enrollment surged to 1.6 million (Dougherty, 1994; Gilbert & Heller, 2013; Rendon & Valadez, 1994). Such proliferation was not sustained, however, in the environment of the late 1970s and early 1980s. Growth slowed by almost 50% and enrollments plateaued as financial constraints began to limit the state funding increases that had fueled decades of expansion (Dougherty, 1994).

The market economy of the 1980s also shifted the public's focus from educational access to return on investment. Student performance was a growing concern, and public stakeholders began questioning assumptions about higher education productivity (Lubienski, 2000). The basis for legitimacy changed as new demands for accountability emerged.

Higher Education Legitimacy

Legitimacy is the "generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574). Organizational legitimacy justifies an institution's existence and supports a competitive position among other public entities for scarce resources (J. W. Meyer & Scott, 1983). Alternatively, lack of legitimacy creates vulnerability and threatens an organization's survival (Parsons, 1960).

Prior to the 1980s, loose coupling between public expectations and institutional outcomes supported a socially constructed, subjective basis for higher education legitimacy. Loosely coupled entities demonstrate only weak attachments and are slow to respond to each other; they are also described as sharing few or only weak variables (Glassman, 1973; Weick, 1976). During the early and mid 20th century, higher education legitimacy was built on perception of institutional value rather than actual performance (J. W. Meyer & Rowan, 1977). The public endorsed access as the primary community college mission, and state legislatures validated access as the basis for legitimacy through enrollment-based funding (Paulsen & Smart, 2001). Demonstration of value was neither expected nor demanded (Gamoran & Dreeben, 1986).

In addition, colleges received broad bipartisan support. Republicans extolled the contribution of workforce programs to economic growth, while democrats promoted community colleges as effective vehicles for social equity (St. John & Parsons, 2004b). The *organized anarchy* model of higher education, in which campus activities were not strategically oriented or linked to effects, continued from the 1970s through the mid-1980s (Birnbaum, 1988; M. D. Cohen & March, 1974). Middaugh (2010) referred to this as a time of "charmed existence" for higher education, when the "positive impact of college upon the student remained an almost righteously unexamined premise" (Ewell, 1983, p. 7). This model was sustainable only as long as higher education quality was unquestioned (Burke & Minassians, 2002).

Higher education quality was questioned, however, beginning in the mid to late 1980s. Economic efficiency superseded social equity in national priorities. Postsecondary

graduates had been considered assets to society for over a century, now higher education was increasingly viewed as a private benefit rather than a public good (Marginson, 2011). Concerns mounted that educational systems were not meeting the nation's needs. Loose coupling between expectations and outcomes transitioned to tight coupling as conservatives began challenging institutions to demonstrate their productivity, and demands for accountability increased (Ewell, 1983; Lubienski, 2000). A growing accountability movement was evident in new accreditation standards and performance-based funding models (Roueche, 1997). No longer were higher education institutions allowed to function as "holding companies containing shares of stock in uninspected activities" (J. W. Meyer, 1975, p. 4). -

The Accountability Movement

A new basis for organizational legitimacy - one that more tightly coupled institutional activities to performance - led to demands for assessment and laid the foundation for a national accountability movement. Romzek (2000) defined accountability as "answerability for performance" (p. 22). Furthermore, the author noted that calls for greater accountability are often, in effect, calls for a different type of accountability - accountability that changes how performance is evaluated. General accountability measures, including those in higher education, assess inputs, processes, outputs, and outcomes (Romzek, 2000). Inputs and processes were the basis of higher education accountability in the 20th century (Lingenfelter, 2007). Policy makers concerned themselves with inputs such as campus facilities and selective admissions

criteria, and processes involving the flow and use of campus resources, with their associated governance structures (McLendon, Hearn, & Deaton, 2006).

This changed in the 1990s as critics asserted that higher education organizations were not as responsive as private entities to their external stakeholders (Rabovsky, 2012). Public concern over tuition and fee increases, job placement, and workforce needs further directed attention to postsecondary performance. Demands for efficiency in government agencies spilled over to include public colleges and universities, which were frequently seen as mismanaged and economically inefficient (Middaugh, 2010). As a result, outputs and outcomes replaced inputs and processes as the primary postsecondary accountability metrics.

Three new priorities drove the higher education accountability movement: encouraging internal improvement, requiring institutions to address state priorities, and increasing transparency for consumers regarding institutional performance (Burke & Minassians, 2002). Each was triggered by a public concern or national or local need, including

- rapidly changing demographics;
- workforce projections that revealed potential deficits in America's educational outputs;
- state expectations that postsecondary institutions play a role in meeting economic and industry needs; and
- disparities in educational attainment among student populations.

A Nation at Risk, the 1983 report of President Reagan's National Commission on Excellence in Education, reflected the growing public concerns over America's educational systems.

> Our nation is at risk.…the educational foundations of our society are presently being eroded by a rising tide of mediocrity….What was unimaginable a generation ago has begun to occur--others are matching and surpassing our educational attainments….We have, in effect, been committing an act of unthinking, unilateral educational disarmament (D. P. Gardner, 1983).

While the report was both applauded and criticized, it changed the conversation on higher education in America (American Institutes for Research, 2013; W. E. Gardner, 1984). The report was followed by calls for increased standards and assessment.

The Southern Association of Colleges and Schools broadened early accountability efforts in 1986 when they required institutions to implement self-evaluation measures. By 1997, all U.S. accrediting agencies required colleges to have some type of assessment or accountability plan (Roueche, 1997). Early metrics included data on diversity, transfer, and graduation rates. Colleges, however, were slow to respond - many lacked the infrastructure, resources, and expertise needed to gather and interpret outcomes data (Roueche, Ely, & Roueche, 2001). Despite such limitations, Roueche et al. (1997) observed that external pressures for accountability were increasing and time was "running out for colleges who fail to act" (p. 184).

In 1993, the Wingspread Group on Higher Education – a meeting of higher education leaders sponsored by four private foundations - released their report *An*

American Imperative: Higher Expectations for Higher Education. The report echoed earlier concerns and warned that increased higher education accountability in the 21st century would be critical for the nation's welfare. Emphasizing deficiencies in undergraduate preparation on American campuses, the report urged greater accountability for higher education and recommended that educational support systems be redesigned to increase student success (Johnson Foundation, 1993).

Public impatience with higher education's response to calls for greater accountability continued through the end of the 20th century. In 1994, Arthur F. Quern, past Chairman of the Illinois Board of Higher Education, addressed the State Higher Education Executive Officers Association, and warned that if higher education did not embrace accountability, society would intervene with "other and perhaps new organizations which may well not be linked to the traditional community of scholars" (Quern, 1994, p. 8). Meyer (2002) later noted similar risks, acknowledging the critical role of education in an increasingly knowledge-based society:

> As educational organizations become more central to knowledge-dependent societies, they need to make quantum leaps in their ability to learn and change. Having until recently been notorious for their resistance to change, they are now expected to confront change strategically and pro-actively. In their new role in the knowledge society, schools and universities need to learn how to change from within, rather than to wait for coercion from without. (p. 518)

For several decades, higher education researchers and observers warned that external groups would enter the accountability arena if the sector failed to police itself. In the

early 21st century, a new type of philanthropy - advocacy philanthropy - began significantly influencing higher education policies and practices. Mega-foundations used their influence in unprecedented ways, exerting a highly organized and financially powerful mark on higher education, and transforming community college practices nationwide to emphasize student success and completion.

The Completion Agenda

During the 20th century, philanthropic ambitions were limited primarily to grant-making; they seldom included politics and policy. However, the early 2000s evidenced a change in direction as several grant makers enthusiastically entered the policy arena. In 2012, the Guiding Principles for the Philanthropy Roundtable (a network of American donors) included "voluntary private actions offer solutions for many of society's most pressing challenges" and "excellence in philanthropy is measured by results, not by good intentions" (Philanthropy Roundtable, 2012, p. para. 1). The Lumina Foundation, with an endowment greater than $1 billion, focuses solely on increasing student success and educational attainment. Lumina Foundation President Jamie Merisotas, described the foundation as "more than just a grant-making organization…we also engage in public policy advocacy, and we use our communications and convening power to foster partnerships and to build public will for change" (Merisotas, 2010, para. 5).

The Bill and Melinda Gates Foundation also targets higher education, specifically increasing the number of young adults with a postsecondary degree or certificate (Pennington, 2008). Hilary Pennington, director for education, postsecondary success, and special initiatives from 2006-2012, described their strategy:

> We will use our voice…to raise awareness about the urgency of our goal and building support for the policy and financial commitments needed to achieve it….We will support research to identify the best policy approaches and the best institutional practices to accelerate completion, and we will leverage that information, sharing what we learn with key decision makers throughout the nation. (strategy 2, para. 3 and 7).

In addition to the Bill and Melinda Gates Foundation and the Lumina Foundation, the Ford Foundation, the Carnegie Corporation of New York, and the W.K. Kellogg Foundation also made substantial investments in higher education issues (Stewart, 2012).

The first large-scale, formal student success initiative - Achieving the Dream – was launched in 2004. Founding partners included the Lumina Foundation, the American Association of Community Colleges, the University of Texas at Austin, the Community College Research Center (Teachers College, Columbia University), and Jobs for the Future. Achieving the Dream emphasized measuring and increasing student learning, particularly for students of color and low-income students (Achieving the Dream, 2018).

At least thirteen additional student success initiatives were implemented between 2004 and 2012, funded by foundations and non-governmental educational organizations (Stewart, 2012). Advocacy philanthropy, backed by the significant financial resources of mega-foundations, supported efforts to improve student success. O'Banion (2010) observed that never before had a community college movement been "so widely joined and supported by such deep pockets" (p. 2).

In 2009, President Obama formalized a national completion agenda with the announcement of his American Graduation Initiative (Obama, 2009). The initiative pledged approximately $12 billion dollars over 10 years to support community colleges, with a goal to produce five million additional college graduates and attain the highest graduation rate globally. Support was reduced to $2 billion in 2010, and narrowed to target workforce training programs, due to economic challenges and efforts to pass the Patient Protection and Affordable Care Act. Funding for community colleges continues to be a major challenge.

Community College Funding

Historically, the greatest source of community college revenues came from state funding. Understanding 21st century financial pressures on community colleges includes understanding the characteristics of state funding - including (a) challenges in measuring state funding; (b) state support for higher education in the 21st century; and (c) how higher education competes for state resources. In addition, it is important to review the use of funding as a policy lever - a pressure which adds to the accountability demands on community colleges. Increased financial pressures from reduced state funding and increased accountability demands from performance-based funding highlight the need for greater use of CEA in 21st century higher education.

Characteristics of State Funding

In the first half of the 20th century, community colleges were small institutions or extensions of public school systems. Little attention was paid to college revenues or expenditures, and local support comprised 94% of college revenues (A. M. Cohen &

Brawer, 2008). Following WWII, new colleges were established in greater numbers, enrollments climbed, and college budgets increased. Property taxes were stressed by the burgeoning demands, and local governments began turning to states for postsecondary support (Wattenbarger, 1994).

States, however, proved to be an inconsistent source of revenue. The federal government provides direct support to higher education in the form of grants and subsidized student loans, however the majority of community college operational support comes from state general fund appropriations and local sources (Lingenfelter, 2008; Tollefson, 2009). By 2007, local support averaged only 8% of college revenues – a stark decline from the earlier levels of 94% (Katsinas & Tollefson, 2009). State support became increasingly important; however, state general fund budgets are highly sensitive to economic conditions. States struggled through the late 20th century and into the 2000s. Funding for state governance operations as a percentage of personal income fell continually in all states from the 1980s through 2004 (Zumeta, 2004). While funding for higher education, in terms of actual dollars, increased during the last half of the 20th century, the rate of increase slowed. Lingenfelter (2008) reported that state funding for higher education operating budgets quadrupled in the 1960s, tripled in the 1970s, doubled in the 1980s, grew by 50% in the 1990s, remained flat in the early 2000s, and then began increasing again in 2007.

Challenges in measuring state funding of higher education. The literature on trends in state funding for higher education is unclear and contradictory, dependent on the context in which funding is considered (Callan, 2002; Zumeta, 2004). Organizations and

individuals who research state support for higher education collect data from different sources, use different independent and dependent variables, and measure over different timelines – leading to confusion and disagreement in reports on state support.

The five data sources most commonly used are the National Association of State Budget Officers' annual State Expenditure Reports, the National Center for Education Statistics, Illinois State University's Grapevine *Annual Compilation of State Fiscal Support for Higher Education,* the U.S. Census, and the State Higher Education Executive Officers' *State Higher Education Finance* report (Tandberg & Griffith, 2014). Measures of state support include: funding per full-time equivalent student (FTE), funding per $1000 of personal income, funding per capita, and funding as a share of total state expenditures. Each of these requires that state higher education funding be divided by a selected variable. Researchers select these variables, analyze their data, and identify trends based on their individual research questions and intended audience. All of this must be considered when comparing different reports (Tandberg & Griffith, 2014).

The absence of defining and widely accepted measures of state support for higher education contribute to apparent contradictions. Trostel and Ronca (2009) sorted multiple measures of state funding into two categories: *ability to pay*, and *need*. Ability to pay variables reflect a state's funding capacity. Use of these variables compares a state's ability to fund postsecondary education with its actual funding level, and serves as an indicator of state effort. Measures that fall in this category include state funding per $1,000 of personal income and higher education spending as a percentage of total state spending. Need variables reflect a state's need for higher education and serve as a proxy

for demand. Use of these variables compares a state's need for funding to actual funding, and reflects a state's adequacy in funding higher education. Measures that fall in this category include funding per FTE student and funding per capita (Tandberg & Griffith, 2014).

These measures, used independently, can show different pictures of state funding. Trostel and Ronca (2009) addressed challenges in identifying state funding trends with a new measure that combined ability to pay variables with need variables: "state postsecondary education funding per high school graduate over the previous four years per dollar of per capita income" (p. 238). Use of this measure indicated that state support for higher education was flat in the early 1980s, increased steeply from 1984 to 1995, plateaued through 2000, and then began declining.

State support for higher education in the 21st century. In 2009, community colleges in 34 states experienced mid-year budget cuts (Katsinas, D'Amico, & Friedel, 2014). Rural community colleges were particularly hard hit due to lower property tax wealth in their service areas, impacting approximately one-third of the nation's community college students (Katsinas et al., 2014). Broad declines in state support for higher education persisted through 2012.

Fortunately, sharp budget cuts began to subside in many states in 2013; local and state funding per full-time equivalent (FTE) student increased by 5% at public two-year colleges (Descrochers & Hurlburt, 2016). Despite this relief, state funding remains below pre-recession levels. Community colleges are particularly vulnerable to economic downturns. They receive a greater proportion of their revenue from state and local

sources than do four-year institutions (Baum & Kurose, 2013). Furthermore, community college enrollments typically increase under conditions that lead to state funding decreases.

Community colleges are also uniquely disadvantaged in addressing state budget cuts due to their limited ability to raise tuition and small, if any, endowments. When state funding for postsecondary education declines, the burden of cost increasingly shifts to students and their families as institutions raise tuition to make up for funding shortfalls (St. John & Parsons, 2004a). Low tuition at community colleges supports diversity and facilitates increased access and social opportunities; tuition increases beyond a marginal level negatively impact diversity, reduce access, and potentially lead to declines in enrollment due to students' inability to pay (Wattenbarger, 1994).

In addition, research universities receive significant federal subsidies in the form of tax exemptions on large endowments. While the number of community colleges with significant endowments has grown, most community colleges do not have comparable endowment funds to draw on during times of fiscal challenge, nor do they benefit from comparable tax subsidies (Baum & Kurose, 2013). In 2013, total support per FTE student (local, state, and federal funding plus tax subsidies) was $41,000 at private institutions with large endowments, $15,300 for students at flagship universities, and $5,100 for community college students (Klor de Alva & Schneider, 2015).

Competition for state resources. Regardless of trends in state funding or institutional strategies for responding to budget cuts, higher education is disadvantaged in state budget structures that must accommodate competing needs (Callan, 2002). State

laws governing K-12 educational appropriations and federal Medicaid funding requirements are mandated. Prison and social services budgets are caseload dependent, caseloads that often increase during economic downturns. In contrast, legislators consider higher education "caseloads" to be elastic – enrollments can be decreased, planned growth postponed, class sizes increased, and additional less expensive adjunct faculty hired (Zumeta, 2004). Callen (2002) observed that reductions in appropriations for higher education are seldom an intentional policy direction pursued by states, but rather reflect the nature of competition for state resources and the perceptions of legislators.

Funding as a Policy Lever

Legislator perceptions also play a role in how higher education appropriations are determined. Prior to the 1980s, most states funded higher education through enrollment-based formula funding. In the 1980s and 1990s, in response to economic challenges and increased scrutiny of taxpayer investments, enrollment-based funding was replaced or supplemented with performance funding designed to increase institutional performance through incentivizing resource allocations (McLendon et al., 2006; Quern, 1994). While the number of adopting states increased and decreased over the years, incentive systems continued into the 21st century (Dougherty et al., 2014b).

Forms of incentive funding include performance funding, performance budgeting, and performance reporting. Performance funding (PF) tightly couples institutional performance on specific metrics to state allocations, performance budgeting uses institutional performance as one factor in the allocation process, and performance reporting requires institutions to provide performance data to legislatures and the public

but does not link performance to funding (McLendon et al., 2006). In addition, there are two functional categories of PF:

- PF 1.0: Funds are tied to predetermined outcomes and awarded in addition to regular appropriations (usually determined by enrollments and prior year funding levels). Allocations seldom exceed five percent of total funding.
- PF 2.0: Allocations are an integral component of base funding, and may comprise up to 90% of higher education state funding (Dougherty, Natow, Pheatt, & Reddy, 2016).

The earliest performance funding systems were of the PF 1.0 type. Tennessee, an early adopter of incentive funding, established their PF 1.0 system in 1979, then implemented PF 2.0 in 2010 (Dougherty et al., 2014a; Dougherty & Natow). By 2015, thirty-two states used a formula that allocated at least a portion of community college funding based on performance (National Conference of State Legislatures, 2015).

Performance metrics vary by state. The National Conference of State Legislatures (NCSL) compiled a list of public two-year college performance indicators in use in 2015. Metrics include but are not limited to: course completion, credit hours earned, completion of developmental course sequences and progression to first college level course, student transfer, credential and degree completion, retention, STEM credentials awarded, certificates or degrees awarded to minority students, and cost per graduate. Metrics in some states reflect unique state priorities. For example, Nevada promotes economic development by awarding points for the number of degrees and certificates awarded to graduates in disciplines that support the state's economic development plan. In New

York, colleges are rewarded for implementing programs that help students balance personal, work, and school responsibilities. Utah awards funding for job placement rates following graduation (National Conference of State Legislatures, 2015).

Not surprisingly, the 2015 NCSL list of performance indicators does not include a measure of institutional effort to use allocated funds as efficiently and effectively as possible. Student success metrics are common, and cost metrics are common – what is missing is an attempt to measure the relationship between the two. Wellman (2010a) observed that despite extensive progress in improving and measuring effectiveness, "we have yet to cross the rubicon of connecting the dots between educational practices that promote student learning and the way that funds are used" (p. 3).

The connection between funding, costs, and performance was emphasized by the National Commission on the Cost of Higher Education, established by Congress prior to the 1998 reauthorization of the Higher Education Act. The commission's report "Straight Talk About College Costs and Prices" included the following recommendations:

- Academic institutions will intensify their efforts to control costs and increase institutional productivity.
- The academic community will provide the leadership required to develop better consumer information about costs and prices and to improve accountability to the public.
- Governments will develop new approaches to academic regulation, approaches that emphasize performance instead of compliance, and differentiation in place of standardization.

- The academic community will develop well-coordinated, efficient accrediting processes that relate institutional productivity to effectiveness in improving student learning. (Harvey, Williams, Kirshstein, O'Malley, & Wellman, 1998, pp. 15-17)

The National Association of College and University Business Officers (NACUBO) developed a voluntary report in response to the recommendations. The reporting format provided for institutional comparisons on spending for undergraduate instruction. However, subsequent studies revealed that few institutions used the methodology (Wellman, 2010b).

Higher education support is unlikely to return to prerecession levels, with continued pressure on institutions to "do more with less" (Zumeta, 2014, p. 43). Postsecondary concerns focus primarily on funding requests, rather than first asking how much funding is required to increase student success and attainment. Legislators use performance funding to link appropriations to performance, yet fail to ask to what degree performance is impacted by appropriations. The critical juncture between funding and outcomes is seldom considered, despite its unique potential to guide stakeholder conversations that increasingly emphasize higher education productivity. CEA can establish these links.

Productivity and Efficiency in Higher Education

CEA is a valuable tool that can improve community college productivity and efficiency. This section reviews the literature on higher education productivity and efficiency, beginning with a brief introduction, followed by challenges in measuring

productivity, challenges to improving productivity, organizations involved in measuring and improving productivity and efficiency in higher education, and productivity and efficiency in community colleges.

Introduction to Higher Education Productivity and Efficiency

Productivity and efficiency are aspects of a higher education *production function* - a process used by colleges and universities to produce outputs from inputs, utilizing available technology (Bowles, 1970; Hopkins, 1990). Outputs are goods and services; examples of higher education outputs include research, community services, credit hours taught, degrees and certificates awarded, remedial courses completed, and student transfers (Massy, 2012). Inputs are resources used to produce the goods and services (Pilat & Schreyer, 2002). Examples of higher education inputs include faculty, professional staff, instructional materials, advisers and counselors, facilities, equipment, and students. Technology - when referenced as part of a production function - describes the methods employed by an educational institution to transform inputs into outputs (Lieberman & Hall, 2005).

Productivity and efficiency - while similar and equally applicable to higher education - are fundamentally different measures. Defined in an economic context, productivity is a solely quantitative relationship - it is the *quantity* of outputs produced from a *quantity* of inputs (Belfield, 2015b; Massy, 2012).

Productivity = quantity of outputs/quantity of inputs

In its *pure form* it is a technical concept and does not include costs (Massy, 2012, p. 3). When input costs are considered, productivity serves as an efficiency measure, and "the key yardstick of economic performance" (Pilat & Schreyer, 2002, p. 163).

Efficiency ratios are productivity ratios with costs included. Efficiency is often expressed as unit cost, or cost per unit of output. Unit cost is calculated as a quantity of outputs divided by the total cost of the quantity of inputs required to produce the outputs (Belfield, 2012).

Unit cost = quantity of outputs/total cost of inputs

Examples of efficiency metrics include cost per degree and cost per retained student. Belfield (2012) defined efficiency as "the production of a given output at the lowest possible cost". A fully efficient process is one that maximizes the quantity of outputs possible with a fixed level of inputs, at the lowest cost, with available technology (Agasisti & Belfield, 2016; OECD, 2001).

Productivity and efficiency can be expressed in multiple ways, depending on the categories of inputs included

- single-factor productivity - the ratio of an output measure to a single input;
- multi-factor productivity - the ratio of an output measure to a collection of inputs; and
- total-factor productivity - the ratio of an output measure to all inputs used in the production process (Diewert & Lawrence, 1999; OECD, 2001).

It is difficult to ensure that all inputs in an educational production function are identified; in addition, the methodology is not easily explained to policy makers. As such, multi-

factor productivity is preferred for many higher education productivity calculations (Belfield, 2012; National Research Council, 2012a).

When the term *productivity* is used, it is important to discern whether it is technical productivity or efficiency that is being referenced. This distinction is not broadly understood. Massey, Sullivan, and Mackie (2012) discussed the potential confusion that can arise when policies target both productivity and efficiency. As an example, they cite an increase in cost per degree. This might be interpreted by stakeholders as a decrease in productivity. However, the causes of the increase must first be determined. If cost per degree increased due to an increase in labor *prices*, efficiency is reduced but technical productivity could be unchanged. A decrease in technical productivity occurred only if there was an increase in the *quantity* of labor inputs.

This distinction is particularly important when the goal is productivity improvement. Efficiency improves when the same number of outputs are produced at a lower cost, or a greater number of outputs are produced for the same cost. This can be accomplished by substituting lower cost inputs for higher cost inputs, or replacing less effective programs with more effective programs at the same cost (increasing both efficiency and productivity). In contrast, improving productivity requires the latter - an institution must fundamentally change their production process (Jenkins & Rodríguez, 2013). This usually involves changing technology through innovation, or the implementation of proven best practices (Jenkins & Rodríguez, 2013; Massy, 2012).

Concerns about higher education productivity and efficiency were evident as early as the first decade of the 20th century. Morris L. Cooke, in his report “Academic and

Industrial Efficiency" underwritten by the Carnegie Foundation for the Advancement of Teaching, observed:

> One industry may have been forced to a high degree of efficiency through intense competition…while another, managed by men as able, may be using the methods of a generation past, simply because it has never felt the spur of necessity. In making a study, therefore, of the colleges and universities, one would expect to find much that could be improved. (Cooke, 1910, p. 8)

Cooke's (1910) reference to the "spur of necessity" presaged 21st century pressures for increased higher education accountability and efficiency, and the "spur" of policy levers such as performance funding.

Cooke (1910) also noted that foundation donors would be more likely to support higher education institutions that demonstrated efficient operations, reflecting growing expectations that colleges pursue efficiency as seen in the private sector. The student credit hour - promoted by Cooke - was developed in part as an attempt to subject higher education to the same market pressures that affected private businesses (Shedd, 2003). The relevance of the credit hour to modern student learning, as well as its place in higher education budgeting, is increasingly questioned (Wellman, 2003). However, the challenges faced by the Carnegie Foundation in measuring and improving productivity in higher education in the early 20th century persist to the present day (National Research Council, 2012a).

Improving productivity and efficiency is essential to ensuring affordable and equitable postsecondary opportunities:

> Without technology-driven and other production process improvements in the delivery of service, either the price of a college degree will be beyond the reach of a growing proportion of potential students or the quality of education will erode under pressures to reduce costs. (National Research Council, 2012a, p. 19)

In meeting this challenge - whether at the institutional, system, or sector level - improving productivity requires a way to measure productivity.

Measuring Productivity

Efficiency cannot be determined without first measuring productivity, and productivity is inherently difficult to measure. Despite its critical importance, it is poorly understood in higher education (Gates & Stone, 1997). The various components involved in productivity - outputs and inputs, terminology and metrics, data requirements, and quality concerns - all present substantial challenges.

Outputs and inputs. Higher education institutions have a broad array of potential outputs and inputs, primarily due to differences in size, mission, degree mix, and students (Layzell & Caruthers, 2002). Characterizing outputs is further complicated by a lack of consensus as to what colleges produce, and the contributions of different funding entities - each of which may perceive outcomes according to their unique agenda (Belfield, 2012; Cohn, Sherrie, & Santos, 1989; Saunders, 2001). Critically, both inputs and outputs are affected by quality concerns (Jenkins & Rodríguez, 2013).

Universities and community colleges both have joint production functions involving multiple outputs, although universities are more complex. University outputs

include instruction, research, and public services. Overlapping interactions complicate the association between inputs and outputs; each output will have a unique set of inputs, however one set of inputs can have multiple outputs. This is particularly problematic when trying to disentangle instructional and research components. Hopkins (1990), referring to university research functions, accurately predicted that identifying and measuring research outputs would "remain an elusive problem" (p. 30). This was evident when the National Research Council (NRC) panel on improving the measurement of productivity in higher education included two-year, four-year, and research universities in their study. Due to the complexity of including university research and public service outputs, they chose to limit their work to instructional productivity (National Research Council, 2012a).

Two-year colleges are relatively simpler and seldom have research or public service functions. They do, however, have multiple outputs - including associate degrees, short- and long-term credentials, and transfer students. Community college outputs are not limited to awards and transfers; completing even a few credits can improve a student's lifetime earnings (Bahr, 2014). Taking community college courses, even without earning a credential or degree, improves long-term health, decreases involvement in the criminal justice system, and decreases demands on social services (Belfield & Bailey, 2011).

Quality concerns are paramount, affecting both inputs and outputs. Students are a central input, however their level of preparedness varies between institutions, and between programs. Faculty teaching is also an input, with potential quality differences

between part-time and full-time faculty. Regarding outputs, the quality of graduates may differ from institution to institution. While proxies have been proposed, there is currently no standard way to assess or measure differences in quality. For these reasons, broad productivity measures may be most applicable at the sector level, where aggregation minimizes variations in quality (National Research Council, 2012a). Quality will be discussed more fully in a later section.

Terminology and metrics. The terminology and metrics involved in higher education program and policy discussions - productivity, efficiency, performance, cost, and price - are often misunderstood and misused (Belfield, 2012). Different stakeholders use these terms differently, often inaccurately, and frequently contextualized to their priorities. This complicates the measurement of productivity and efficiency. It also perpetuates confusing, and often redundant, education-related proposals (Massy, 2012).

For example, cost is what a college expends to provide an educational service, while price is what a student pays (Winston, 1999). Belfield (2012) observed that President Obama's "Blueprint for Keeping College Affordable" conflated cost and price. The proposal suggested student aid reform, work-study programs, and the creation of college scorecards as federal approaches to "tackle college costs" when the intent was to mediate prices (The White House, 2012). The vague and often interchangeable use of *productivity* and *efficiency* is more serious - particularly when used for institutional comparisons or in accountability metrics (Jenkins & Rodríguez, 2013; National Research Council, 2012a).

Massy (2012) noted a critical difference between productivity and efficiency particularly relevant for policy and decision makers. As referenced earlier, productivity can be masked by the price changes reflected in unit costs and, therefore, cannot be correlated with efficiency. Interinstitutional comparisons based on productivity or efficiency metrics are easily misinterpreted. Unit costs can vary between institutions, and quality is difficult to quantify - leading to inaccurate conclusions. Furthermore, Massey (2012) emphasized that both productivity metrics (e.g. graduation rate, transfer rate, time to degree) and cost metrics (e.g. cost per degree) are needed, but it is important to distinguish between them. They can be used to develop productivity and efficiency measures, but should not be used as productivity and efficiency measures in and of themselves (Massy, 2012).

In contrast to productivity and efficiency measures that include inputs and outputs, performance metrics express only a quantity of outputs. There is no consideration of input cost or quantity, therefore performance metrics should never be used as productivity or efficiency indicators. Performance metrics include: number of graduates, number of degrees awarded, number of students retained, and number of students who completed gateway courses. High performing colleges may be viewed by the public as more productive, efficient, or effective than low performing colleges. While this may be true in the case of individual colleges, it cannot be concluded from performance metrics alone. Such misleading interpretations of performance measures contribute to public perceptions that higher education is declining in value. One institution may award half the number of degrees as a second institution, but it may also

be using half the resources and working with less prepared students - none of which is reflected in performance metrics.

Data. In addition to the absence of standardized terminology and metrics, the data currently reported by postsecondary institutions is inadequate for measuring productivity and efficiency. Traditional cost accounting methods used in higher education do not include the detail needed to identify individual input costs (Wellman, 2009). State-level and institutional data methods were designed for routine business operations; they do not support analysis of productivity and efficiency. Furthermore, the absence of standardized measures and metrics means that information collected by individual institutions is not easily comparable (National Research Council, 2012a). The NRC panel on Improving the Measurement of Productivity in Higher Education noted three challenges to using state level databases

- lack of standardized definitions;
- incomplete institutional and content coverage; and
- relative inexperience in linking methodologies to create comprehensive longitudinal databases (National Research Council, 2012a, p. 116).

However, the panel also stressed the critical importance of moving forward with the data that is available:

> Stakeholders have used whatever data and measures are available in an attempt to understand trends and perceived problems; for better or worse, some version of productivity *will* be measured. Therefore, it is crucial to develop coherent measurement tools that make the best possible use of available and potentially

> available data. Failure to do so will keep the door open for an ever-expanding profusion of measures, many of them unnecessarily distortive, and endless debates about measurement as opposed to productivity itself. (National Research Council, 2012a, p. 11)

Improvements in measuring productivity will require standardized data collection procedures. In light of this, the NRC panel recommended changes to Integrated Postsecondary Education Data System (IPEDS) reporting requirements. (National Research Council, 2012a).

Quality. Quality is "the elephant in the room" in discussions of higher education productivity (Massy et al., 2012, p. 6). Nevertheless, consideration of quality is critical in interpreting productivity and efficiency measures. For example, an increase in graduation rate could be perceived as an increase in productivity. However, absent quality measures, it is not discernable if graduation rates increased due to increased efficiency (e.g. implementing innovative technology) or decreased quality (e.g. grade inflation). Corallo, Gilmore, and To (1988) stated the problem: "…a gain in the number of outputs per unit of input would not represent an increase in productivity if, at the same time, the quality of the outputs decreased" (p. 212).

The absence of a reliable and accepted measure of quality is one reason that productivity and efficiency measures should not be used to compare institutions, or in accountability programs (National Research Council, 2012a). It would be inconclusive and potentially misleading to compare two community colleges on the basis of cost per degree without considering their service areas, how they assess students for remedial

placement, and other factors related to the preparedness of incoming students. Even when these factors are considered, the variables influencing cost per degree are complex and render meaningful conclusions unlikely. Institutions can use such a measure to assess their own performance over time, or in light of programmatic interventions, but the complexity of variables must be factored into any discussion or conclusions.

Baumol, Black, and Wolff (1989) define productivity measures that do not consider changes in quality as *gross productivity*. Massey and Wilger (1992) noted that public criticism of rising unit costs in higher education are usually responses to gross productivity measures. As such, they are a concern only if output quality declined. This distinction is seldom understood or recognized by stakeholders and critics.

The problem persists, in part, because higher education operates outside a market economy, one in which price would serve as a proxy for quality (Erickson & Johansson, 1985). Public postsecondary prices are kept artificially low through subsidies; the value of education is not fully reflected in the price (Gates & Stone, 1997). Unfortunately, challenges in measuring quality are unlikely to resolve in the near future. There are presently no standardized or widely accepted ways to define or quantify quality (Powell, Gilleland, & Pearson, 2012). Furthermore, measuring quality is not possible with current data and methodology limitations, and implementing necessary changes will take many years (National Research Council, 2012a).

In the past, accreditation and public opinion were accepted as anecdotal quality measures. Adams (1993) listed six ways in which society or organizations measured quality in education: reputation, resources and inputs, processes, content (curriculum),

outputs and outcomes, and value added. Reputation, often associated with resources and inputs such as selectively admitted students, is more applicable to universities than to community colleges (Bowen, 1980). Processes (such as faculty governance) and content are still addressed by accrediting agencies. Accreditation also focuses on outputs and outcomes, with an emphasis in the 2000s on how colleges use assessment to improve student learning (Northwest Commission on Colleges and Universities, n.d.). Student-faculty ratios, class size, faculty credentials, and student socioeconomic status have all been used as proxies for quality (Orchowski, 2007; Sapelli & Illanes, 2016). Surveys of student engagement, graduate salaries, and employer satisfaction with graduates have also been considered. Programs such as the Collegiate Learning Assessment and the Collegiate Assessment of Academic Proficiency are steps in the right direction, but incomplete (National Research Council, 2012a). None of these can yet be incorporated into a quantitative productivity measure. Noting the elusive nature of input and output quality, particularly in student learning, Hopkins (1990) advised that 'unless and until educational psychologists can reduce the learning process to quantitative terms with a high degree of accuracy, efforts by economists in this area will remain largely empty exercises in statistical manipulation" (p. 30).

However, abandoning efforts to measure productivity due to current challenges is ill-advised. The NRC panel acknowledged that critics would use the difficulties associated with quality measures to promote a "moratorium on all efforts to measure instructional productivity" (National Research Council, 2012a, p. 80). They also emphasized that failure to develop a productivity measure would "increase the

proliferation of weaker measures" already in use, and recommended that measures based on the best available data and methodology be pursued and applied (National Research Council, 2012a, p. 80). Toward that effort, they proposed that a neutral group be established to monitor higher education quality.

Using a productivity measure, in the absence of quality measures not yet available, requires adaptations. Belfield (2015b), citing common community college demographics, excluded student quality as a variable in his exploration of two mechanisms for improving productivity in community colleges - increasing class size and increasing contingent faculty. The productivity measure developed by the NRC panel was designed to measure changes over time and to be applied at the sector level - where aggregated data would minimize quality differences (National Research Council, 2012a). Gross productivity measures can also be useful, as long as the parameters are understood, to stimulate conversation and focus attention on how quality changes might be affecting changes in gross productivity (Massy & Wilger, 1992).

Resistance to Productivity Improvement

In addition to challenges in measuring productivity, higher education faculty and administrators often resist efforts to improve productivity. Such efforts may be perceived as unethical, counterproductive, or ineffectual. Faculty are most likely to voice ethical concerns, while administrators may believe that dollars equal quality, or that cost increases are unavoidable, as described in Baumol and Bowen's (1966) theory of cost disease.

Ethical concerns. Academic communities, particularly faculty, may feel that productivity and efficiency initiatives are unethical (Zemsky, Wegner, & Massy, 2005). Gumport (2000) noted campus concerns that pursuing productivity and efficiency would undermine educational missions and lead to rationing of educational services. Such concerns began as early as the 1970s when the generous funding that allowed colleges to add and expand programs independent of market demands began to decline. Reduced resources necessitated programmatic choices based on finances rather than access. Community colleges began catering to business needs with specialized training for workers - sometimes at the expense of learner needs (J. S. Levin, 2001; Zemsky et al., 2005).

Assertions that profits took precedence over people were not unfounded (Brint & Karabel, 1989; Chomsky, 1999). Ayers (2005) critiqued neoliberal attitudes that the societal value of community colleges lay in their role as drivers of economic growth, producing workers rather than promoting students' personal development. Engle (2000) characterized public education as a struggle between market ideology and democratic values. Giroux and Giroux (2004) maintained that educational responses to market economies prioritized economic growth over social justice.

Faculty reactions to terms such as productivity and efficiency reflect Ayers's (2005) observation that "language constitutes social action" (p. 5). Perceptions that policy and decision makers value education more for its potential return on investment than as a vehicle for personal growth and civic development fuel faculty resistance to productivity and efficiency initiatives. However, some scholars and advocates position market

interests as potentially compatible with mission statements. Bush (1992) commented on the nonprofit sector and struggles to maintain a non-profit spirit in a for-profit world. He commented on the danger of "blindly" pursuing efficiency practices at the expense of mission, and the risk of accomplishments being evaluated in terms of efficiency rather than social good (Bush, 1992, p. 392). However, he also acknowledged the realities of competition for scarce resources, and recommended that non-profits could reduce the impact of market pressures through cooperation and collaboration. Zemsky et al. (2005) observed that universities have always experienced the competing pressures of market forces and mission goals. They recommended that colleges be "mission-centered and market-smart" by investing revenues generated by market-driven programs on mission-centered programs that lacked market demand (Zemsky et al., 2005, p. 57). Community college are less able to employ such work-arounds; they must use cross-subsidies to fund expensive career and technical programs. However, the observation that "…a dollar saved in production cost is a dollar freed up…" applies equally to universities and community colleges, and reflects one of the benefits of using CEA (Zemsky et al., 2005, p. 68).

Perception that dollars equal quality. Another perception, particularly on the part of college administrators, is that dollars equal quality. College leaders often request additional state funding without questioning the level of funding required to meet student success goals (Wellman, 2010a). In addition, leadership may respond to public concerns about outcomes with claims of inadequate resources (Massy, Graham, & Short, 2007). Such claims may be true, but without investigating the relationship between spending and

outcomes, their verity cannot be established. Massey et. al. (2007) asserted that perceiving quality improvements as conditional on increased funding is counterproductive, and prevents institutions from exploring the possibilities of more effectively using available resources.

Furthermore, studies fail to demonstrate a consistent connection between institutional resource level - measured as spending per student - and student outcomes (P. J. Kelly, 2009; Smart & Toutkoushian, 2001). Where expenditures are targeted, however, does make a difference (Wellman, 2010a). Kelly and Jones (2007) found that while revenue availability and aggregate state spending was not correlated to graduation rates, increased spending on student support services was, suggesting that how money is spent has a greater impact on student success than absolute revenue levels. This was especially true at community colleges, with the greatest effect at institutions with the highest percentage of Pell grant recipients (Webber & Ehrenberg, 2010). Webber and Ehrenberg (2010) found that reallocating $100 per student from academics to student services increased graduation rates by 0.5%.

Budgeting practices may contribute to the perceived link between dollars and quality. Incremental budgeting is the most common type of community college budgeting process (Lasher & Greene, 2001). Incremental budgeting applies any additional funds to the base budget as a percentage increase, without reassessing the value of the activities. In contrast, flexible budgeting practices allow institutions to examine institutional priorities and allocate resources accordingly. Colleges do not have adequate resources to give all possible activities equal priority (Wellman, 2009). Incremental budgeting avoids

competition between programs, as well as the immense time commitment involved in some flexible budgeting processes such as zero-based budgeting. However, failure to budget strategically risks allocating resources to less effective programs (Massy et al., 2007). Dollars that could be diverted from less effective to more effective programs and initiatives will be underutilized. While community college are relatively efficient, further efficiency gains are possible (Belfield, 2015b).

Cost disease. Those who resist efforts to increase higher education productivity often claim that colleges have no control over costs. They cite "cost disease" - a phenomenon first proposed by Baumol and Bowen in 1966 - as an insurmountable obstacle (A. P. Kelly, 2011). Cost disease contrasts wages and productivity in two branches of the economy - those in which labor hours produce an output (e.g. manufacturing) and those in which labor hours are the output (e.g. service industries). Productivity increases in the manufacturing sector occur regularly as greater quantities of output are made possible, with the same or fewer labor hours, by advances in manufacturing technology and machinery. The increased productivity results in increased wages. The wage increases drive up labor costs in the service sector, but without the commensurate increases in productivity since there is usually no way to perform a service - such as teaching - faster without compromising quality. The result for service sector industries, predicted by Baumol and Bowen (1966), is an endless and inevitable increase in costs.

Baumol and Bowen (1966) used the example of a Mozart string quartet to illustrate cost disease. A thirty-minute piece requires four musicians, a total of two

person-hours of labor. The performance required the same two person-hours of labor in 1990 as it did in 1790 - there is no way to perform the piece faster than thirty minutes without affecting the integrity and quality of the music. Wages, however, did increase over the 200-year interval, even though productivity remained the same (Baumol, 1996). Hence, the cost disease - service sector labor costs increase continuously without the benefit of increased productivity. Many researchers support cost disease as the primary driver of higher education cost increases (Archibald & Feldman, 2008; A. P. Kelly, 2011). Archibald and Feldman (2008) attributed eight decades of rising higher education costs to cost disease.

An alternative explanation for rising higher education costs - revenue theory - was proposed by Howard Bowen in 1980. Revenue theory claims that colleges earn all the money they can, and spend all the money they have (Bowen, 1980). The implication of revenue theory is that institutions could reign in spending if they chose to. Massey, Graham, and Short (2007, p. 13) noted that universities "will never take a self-denying ordinance on spending". There is disagreement on whether cost disease or revenue theory is more explanatory of cost increases in the community college sector (Jenkins & Rodríguez, 2013; Wellman, 2011). Revenue theory may explain why community college spending per FTE decreased during the first decade of the 2000s while university spending increased per FTE during the same time period; two-year institutions were more limited in their ability to raise tuition and therefore suffered greater revenue decreases. However, cost disease also applies to community colleges, where salaries can comprise up to 85% of the operating budget.

Baumol (1967) warned that any efforts to overcome cost disease might be successful in the short run, but would prove ineffective in the long run. Opponents of productivity initiatives maintain that cost disease is inevitable and incurable. Kamenetz (2013, p. 15), however, referred to such claims as the "leading excuse" for the continuing rise in college costs. Advances in technology that did not exist in 1967 (when Baumol and Bowen first proposed their theory) create avenues for productivity improvement in the 2000s. The National Center for Academic Transformation (NCAT) demonstrated that quality can be maintained or improved while reducing educational costs through the use of online and hybrid courses (Twigg, 2005). Strategic approaches can also make a difference. Flexible budgeting can replace incremental budgeting, with an accompanying reexamination of existing budget items and prioritization of student success efforts (D. Jones & Wellman, 2010). Organizational changes can fundamentally alter the production process. Examples include the use of multiple measures assessment to reduce time in remediation, and streamlined academic pathways that reduce time to degree. CEA can improve productivity by identifying programs that are both effective and efficient, facilitating reallocation of resources (A. P. Kelly, 2011).

Efforts to Measure and Improve Productivity and Efficiency of Higher Education

Despite the challenges and time required to generate data and develop appropriate methodologies for meaningful measurements, several organizations have focused on measuring and improving efficiency and productivity in higher education. Their work includes establishing a national database on revenues and expenditures (the Delta Cost Project), increasing student learning outcomes while reducing costs (The National Center

for Academic Transformation), developing a conceptual framework for the measurement of productivity in higher education (the panel on Improving the Measurements of Productivity in Higher Education), and increasing the use of cost analysis in educational evaluation (the Center for Benefit-Cost Studies in Education).

The Delta Cost Project. The Delta Cost Project (DCP) established a publicly available database on higher education revenues and expenditures, facilitating measurement of unit costs (Massy et al., 2012). Organized in 2007 by Dr. Jane Wellman as an independent non-profit organization, the DCP was funded by the Lumina Foundation for Education as part of their "Making Opportunity Affordable" initiative. Dr. Wellman served as the executive director from 2007 to early 2012, when the DCP's tasks and responsibilities were transferred to the National Center for Education Statistics and the American Institutes of Research. DCP's mission was to "…improve productivity in higher education through better targeting of resources to protect student access and the quality of student learning", based on the premise that use of data for strategic decision making allowed containment of college costs while maintaining access and quality (Wellman, 2010a, p. 2; 2010b). The term *delta* in the organizational name was chosen because it represented change. The project logo is a triangle, selected to emphasize DCP's focus on integrating costs, access, and quality through policy (Wellman, 2010b).

One of DCP's principle projects was the development of a longitudinal database designed to support analysis of postsecondary trends over time. Human Capital Research Corporation was commissioned to create the database and make the initial updates, which were taken over by DCP staff in 2009. The database includes information on enrollment,

staffing, student aid, completions, and finance from over 2000 public and private institutions, drawn primarily from the IPEDS. It does not include information on capital expenditures. Importantly, the database was designed to overcome variations in definitions and accounting methods that occurred over time, as well as from institution to institution (Delta Cost Project, 2011). Jacquette and Para (2016) criticized the database's possible exclusion of Title IV institutions, but acknowledged that most public institutions were not affected and that "…reasonable people could disagree about the importance…" of the problem (p. 638).

The DCP database is organized into categories of revenue and spending, including

- revenues by major source, per FTE and adjusted for inflation;
- spending by major function, per FTE and adjusted for inflation;
- the relationship between spending and tuition increases;
- patterns of cost, price, and subsidy over time;
- costs of degrees and certificate completion, measured by education and related expenses, against degree and certificate production (includes community college transfer students); and
- measures of average education and related spending per student, against enrollments by sector (Wellman, 2010b, pp. 33-34).

In early 2012, responsibility for maintaining and updating the database was transferred to the National Center for Education Statistics - the statistical branch of the U.S. Department of Education (Delta Cost Project, 2011). The database continues as a freely available resource for researchers and the public.

The DCP also used the database to produce reports, briefs, and state profiles. This function was assumed by American Institutes of Research in early 2012 (Delta Cost Project, 2011). The series "Trends in College Spending: Where does the money come from? Where does it go?" began in 2009 and continues to analyze ten-year trends in enrollment, spending, and revenue. In addition, targeted reports on higher education issues are released on an ongoing basis. Reports on the impact of contingent and part-time faculty were released in 2016: "The Shifting Academic Workforce: Where are the Contingent Faculty?" and "Cost Savings or Cost Shifting?" (Hurlburt & McGarrah, 2016a, 2016b). In previous years, topics included the cost of producing STEM degrees, student debt, athletic spending, the cost of student attrition, and the potential of technology. State profiles are also maintained by American Institutes of Research and made publicly available on their website, with data drawn from four key metrics: subsidies, revenue, outcomes, and spending.

Lederman (2011) credited the DCP with having done more than any other national organization to make higher education finances understandable and accessible to policy makers and legislators. In addition, Thelin (2014) noted that DCP reports provided critical analyses for state and national policy conversations. The goals and contributions of the Delta Cost Project are summarized in Wellman's (2010b) observation: "There is hope that cost disease can be mitigated through smart institutional management and effective public policy" (p. 35).

The National Center for Academic Transformation. The National Center for Academic Transformation (NCAT) is a non-profit organization founded in 1999 by Dr.

Carol Twigg, with support from the Pew Charitable Trusts. NCAT provides resources, support, and expertise to institutions interested in, or participating in, course redesign. The center promotes the transformation of traditional lecture-based courses, utilizing technology to replace a passive learning process with an active learning experience. The goal is to improve student learning outcomes while reducing instructional costs (Twigg, 2003). NCAT's first effort was the Project in Course Redesign; from 1999 - 2004, NCAT guided redesign projects at 30 two- and four-year institutions. All redesigned courses showed student learning equivalent to, or better than, the traditional course. Twenty-five courses had student outcomes that were significantly better. In addition, all institutions experienced reductions in course costs averaging 37%, with a range from 20% to 70%, and collective yearly savings of $3 million (The National Center for Academic Transformation, n.d.).

In addition to the Project in Course Redesign, NCAT conducted three nationally competitive programs - Roadmap to Redesign, Colleagues Committed to Redesign, and Changing the Equation. The programs were funded by foundations or government agencies and worked to promote course redesign, establish a repository of resources, help institutions with redesign projects, and support community colleges in redesigning developmental math sequences. Between 2006 and 2013, NCAT also ran six state/system projects of whole course redesign, usually targeting large introductory courses. In total, 195 projects were started and 156 were completed. Student learning outcomes were improved in 72% of the projects, and instructional costs were reduced, on average, by 34% (The National Center for Academic Transformation, n.d.).

NCAT requires participating institutions to monitor and measure both course quality and course costs. Redesigned course outcomes are compared to traditional course outcomes at an institution by using common assessments, or comparing baseline outcomes in a traditional course to later outcomes in a redesigned course (National Research Council, 2012a). Costs are estimated and measured using NCAT's course planning tool (CPT) - a spreadsheet that facilitates input of data and calculation of costs. The CPT includes four worksheets:

- Instructional costs per hour (personnel costs).
- Traditional course activities and costs (traditional course delivery and activities costs).
- Redesigned course activities and costs (redesigned course delivery and activities costs).
- Annual cost comparison.

The CPT excludes developmental costs, administrative overhead, support services, infrastructure, and equipment costs (National Research Council, 2012a).

Although the CPT costs of implementing a course redesign are not the total costs, the NRC panel on Improving the Measurement of Productivity in Higher Education referenced NCAT as an example of improving productivity in postsecondary institutions (National Research Council, 2012a). Describing the outcomes of community college redesign projects that utilized technology and asynchronous learning strategies, Twigg (2009) observed that not only did learning improve and costs decrease, but "more students [were] able to achieve their academic goals" (p. 154). NCAT program outcomes

demonstrate that it is possible to improve student learning and outcomes while reducing costs - an approach that required a fundamental shift in higher education paradigms concerning the relationship between cost and quality (Twigg, 1992).

The National Research Council panel on Improving the Measurement of Productivity in Higher Education. In 2009, with Lumina Foundation support, the National Research Council (NRC) of the National Academy of Sciences established a panel on Improving the Measurement of Productivity in Higher Education (National Research Council, 2012a). The panel's charge was to "identify an analytically well-defined concept of productivity for higher education and to recommend practical guidelines for its measurement" (p. 1). Furthermore, any measures the panel proposed were to be based on the economic concept of productivity (Massy et al., 2012). While other substantial efforts to promote and standardize measurements of productivity and efficiency have addressed components of the issue, the NRC panel worked to develop a comprehensive productivity measure (National Research Council, 2012a; Reindl & Reyna, 2011; Reyna, Reindl, Witham, & Stanley, 2010). The panel's report "Improving Measurement of Productivity in Higher Education" was published in 2012 (National Research Council, 2012a).

A task statement presented to the panel at an early planning meeting included: (a) developing a conceptual framework for measuring productivity; (b) describing data requirements; (c) identifying challenges; (d) highlighting dangers associated with the traditional use of simplistic metrics, and; (e) evaluating strengths and weaknesses of

alternatives to any proposed measures. As such, the study proposed to answer the following questions

- What is productivity and how can the concept of productivity be applied to higher education?
- What limitations and complexities are confronted when attempting to do so?
- Why is the measurement of productivity important to education policy?
- Who should care about measuring productivity?
- And, how can the measurement of productivity be improved? (National Research Council, 2012a, p. 9)

In addition, although the panel acknowledged the important role of research in higher education, they chose to focus solely on instructional productivity due to complexities of correlating inputs and outputs in research and public service functions.

Challenges identified by the panel in measuring productivity included: insufficient data availability, inadequate data reporting requirements, different levels of aggregation, and the pervasiveness of inappropriately used metrics. One of the greatest challenges was quality. The panel noted that commonly used metrics such as graduation rates and cost per degree are incomplete and misleading without quality considerations, and may endanger quality when used as such in accountability or incentive programs (National Research Council, 2012a).

Final recommendations for a conceptual framework for productivity measurement in higher education were based on the Tornqvist Productivity Index used by the

Organization for Economic Cooperation and Development and the Bureau of Labor Statistics. As a multifactor productivity index, the model accounts for multiple inputs and outputs, and compares changes in a productivity index over time. Inputs include labor, materials, and capital expenditures related to instruction. Outputs include all credit hours, adjusted to incorporate the sheepskin effect, and completions. In addition, IPEDS contains all required data. The measure was focused on changes in productivity over time at the sector level, and to support policy development. It was not recommended for institutional comparisons (National Research Council, 2012a).

Deferring to future efforts to accurately incorporate quality, the panel suggested that output quality could be measured in learning outcomes, preparation for future coursework, and post-graduation income. Potential proxies for input quality included student readiness for college-level coursework, socioeconomic status, and quality of faculty teaching. The panel acknowledged that measuring quality will not be possible in the near future, but cautioned against abandoning efforts to measure productivity simply because quality is an elusive variable (National Research Council, 2012a) .

To avoid counterproductive incentives, the panel emphasized that they were not developing an accountability system. They also cautioned that until quality adjustments were possible, the measure should not be used for resource allocation decisions and warned that misuse could lead to perceived increases in productivity at the expense of quality (National Research Council, 2012a, p. 4). They also acknowledged their efforts as a starting point for continued work in developing productivity measures. In addition, although they were not charged with exploring ways to improve productivity, they noted

that improvements were possible through the adoption of best practices, incorporation of innovative technology, and eliminating inefficiencies.

The Center for Benefit Cost Studies of Education. The Center for Benefit Cost Studies of Education (CBCSE) was established in 2007 at Columbia University as a research center associated with Teachers College. The mission of the CBCSE is "to improve the efficiency with which public and private resources are employed in education" (Center for Benefit-Cost Studies of Education, n.d.-a, p. paragraph 1). Founded by Dr. Henry Levin, the center combines information on costs and outcomes to evaluate preschool, primary, secondary, and postsecondary educational programs. The CBCSE operates on the premise that productivity improvements in education are possible; that "by considering both costs and effectiveness or benefits of educational programs, policymakers can optimize resource allocation and enhance productivity in education" (Center for Benefit-Cost Studies of Education, n.d.-a, p. para. 1).

The CBCSE is the only organization in the country dedicated solely to conducting and promoting cost analysis in education. The center offered the first independent methods training program in cost analysis for educational researchers in 2015, funded by the Institute of Education Sciences (IES) of the U.S. Department of Education. Six training sessions were offered, with the final IES Methods Training session held in May 2017. Information on additional trainings, as available, can be accessed on the center's website at www.cbcse.org. The methodologies for performing cost analysis in education are presented in several books authored by researchers at CBCSE, beginning in 1983 with Dr. Levin's *Cost-Effectiveness: A Primer* (Levin, 1983). The most recent text, *Economic*

Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis served as the reference for the May 2017 training (Levin et al., 2017). The text provides a guide to cost-effectiveness and benefit-cost analysis, however additional training is necessary for researchers to implement cost analysis appropriately and accurately in program evaluations. Most postsecondary programs that prepare educational researchers do not include training in cost analysis, a void that contributes to the underutilization of cost analysis in education. The development and presentation of the methods training by IES and CBCSE helped to address this void.

In addition to the methods training sessions, the CBCSE developed CostOut - an online tool that helps researchers identify and organize ingredients and prices for cost analysis. CostOut maintains an extensive database of national prices for personnel, facilities, materials, and other. Researchers are also able to enter prices independently and to use local prices when desired for an intended audience. In addition, CostOut incorporates adjustments for inflation and discounting (Levin et al., 2017). The tool can be licensed at no charge, and is available at http://www.cbcsecosttoolkit.org/ (Center for Benefit-Cost Studies of Education, n.d.-b).

Most of the studies completed by CBCSE researchers focus on early childhood, primary, and secondary education (Belfield et al., 2015; Hollands, 2012a, 2012b; Levin et al., 2012). The use of cost analysis in postsecondary education is relatively new, and only a few studies involve the community college sector. The CBCSE completed two studies on the Accelerated Study in Associate Program for the City University of New York - a cost-effectiveness analysis and a benefit-cost analysis. Both showed that, although

expensive, the program was cost-effective and resulted in a significant return on investment (Levin & Garcia, 2012, 2013).

Productivity and Efficiency in Community Colleges

Researchers have demonstrated that public two-year colleges are not as cost-effective in transforming enrollments into completions as four-year institutions and research universities (Wellman, 2011). Community colleges have, however, increased their efficiency over the last two decades more than any other sector (Belfield, 2012). From 2003 to 2013, public two-year colleges decreased their average educational and related expenditures per completion by 22%, compared to a 3% decrease for public four-year colleges and a 6% decrease for public research universities (Descrochers & Hurlburt, 2016). The decrease in community college spending occurred at a time when enrollments were expanding; from 2000 to 2010, FTE enrollments increased by more than 25%. Furthermore, assuming quality remained constant, community college fiscal costs per degree were lower in 2008 than in 1987 (Belfield, 2012).

These efficiency gains were due in part to an increase in the use of part-time faculty and the associated decrease in salary expenditures. Part-time instructors comprised 70% of community college faculty in fall 2010, compared to 46% in fall 1992 (Harris & Goldrick-Rab, 2010; Jenkins & Rodríguez, 2013). However, such responses to decreased revenues may not be sustainable. Some studies suggest that the use of part-time instructors negatively impacts quality, and decreases course completion and graduation rates in academic areas (Harris & Goldrick-Rab, 2010). Strategies that improve efficiency, but decrease quality, will negatively impact productivity over time.

Efficiency improvements occur most frequently through the "elimination of technical and organizational inefficiencies", often achieved by incorporating best practices (OECD, 2001, p. 11). Examples of practices with a demonstrated potential to improve efficiency include (assuming quality remains constant): reduction of excess credits, the use of technology in course delivery, and measured increases in class size (Belfield, 2015b; Twigg, 2009). The dissemination of best practices in higher education is often facilitated through normative and coercive isomorphism. While this may be beneficial in facilitating the sharing of best practices, it can also lead to adoption of programs absent rigorous evidence of effectiveness and data on cost-effectiveness.

Isomorphism occurs when educational units become more homogeneous in response to organizational forms that influence the availability of resources (Hannan & Freeman, 1977). When subject to the same environmental conditions, community colleges may adapt in similar ways (Hawley, 1986). Coercive isomorphism occurs when individual colleges perceive a level of dependence on external organizations, and feel pressured by those organizations to conform to cultural or structural expectations (DiMaggio & Powell, 1983). DiMaggio and Powell (1983) described various forms of pressure, including "force,… persuasion, or…invitations to join in collusion" (p. 150). Normative isomorphism occurs through professional networks, including attendance by faculty or administrators from different colleges at the same national conferences, or hiring personnel who have been through similar training programs (DiMaggio & Powell, 1983).

Many foundations and national educational organizations maintain repositories of recommended best practices. Their efforts have successfully focused the nation, and state and local communities, on student success and raised awareness of deficits in postsecondary outcomes. Best practices promoted and adopted may be both effective and efficient, however, rigorous experimental evidence is sometimes lacking, and there may be inadequate consideration of differences in institutional environments and constraints. In addition, St. John, Paulsen, and Carter (2014) noted that policy choices too often result from political and stakeholder pressures rather than evidence-based decisions. As Levin and Belfield (2015) observed "there is almost no direct evidence to support – on efficiency grounds – the many educational interventions or reforms now being proposed for implementation" (p. 3). Researchers who study community college productivity and efficiency note that while efficiency gains will not be easy, they are possible (Agasisti & Belfield, 2016). For millions of community college students, productivity and efficiency efforts guided by empirical evidence are most likely to provide the requisite support and opportunities, and ensure that scarce resources are used effectively. CEA provides the empirical evidence needed to support data-driven decision making in the adoption and implementation of student success programs.

Cost Effectiveness Analysis

This final section of the literature review will provide (a) an introduction to CEA; (b) a closer look at the characteristics and components of CEA; and (c) explore the use of CEA in higher education, including gaps in the literature and how this study proposes to contribute to the CEA literature.

Introduction to Cost Analysis and CEA

An understanding of CEA begins with reviewing the types of cost analysis and why CEA is unique, the economic foundations of CEA, and a brief history of CEA.

Types of cost-analysis. CEA is one of four types of cost analysis used in economic evaluations. Additional forms of cost analysis include cost-feasibility analysis, benefit-cost analysis, and cost-utility analysis. Each type of cost analysis considers program costs, however only CEA, benefit-cost analysis, and cost-utility analysis incorporate program benefits. In addition, while costs are defined and calculated the same way for all types of cost analysis, benefits are uniquely defined in each.

Cost-feasibility analysis is used to determine if sufficient resources exist to implement and maintain a particular educational program. All required ingredients are identified, the total costs of the ingredients are calculated, and the resources required are compared to the resources available. Cost-feasibility analysis is used in preliminary planning. It answers the question "can we afford this program?". It does not consider the effectiveness or monetary benefits of a program (Levin et al., 2017).

CEA incorporates both costs and effects to evaluate program benefits compared to program costs. Benefits are defined as units of effectiveness, such as gains in test scores, or course completions. In addition, CEA is a comparative analysis - it compares alternative interventions targeting the same outcome to determine which yields a desired level of effectiveness for the lowest cost, or the greatest gain in effectiveness for a specific investment (Levin et al., 2017).

Benefit-cost analysis also compares program costs to program benefits, however in BCA both costs and benefits are monetized (Levin et al., 2017). Benefit-cost analysis is founded in welfare economics. It was used by the federal treasury in the 19th century to evaluate water projects, and later in the 1930s to allocate public funds. In the 1960s and 1970s it was used in additional public sector applications, and by the 1990s was increasingly required by the federal government in project proposals and evaluations (Gnage, Huse, McDavid, & Hawthorne, 2013). In contrast to CEA, which is restricted to evaluating alternative programs, benefit-cost analysis can be used to evaluate a single program. Benefit-cost analysis answers the question "do the monetary benefits from this program outweigh the costs?" Benefit-cost analysis is more complex than CEA, can only be used when it is possible to assign monetary values to benefits, and is the most costly economic evaluation to undertake (Gnage et al., 2013; Levin et al., 2017).

Cost-utility analysis is similar to cost-effectiveness analysis, however where CEA considers only one effectiveness measure, cost-utility analysis allows multiple effects to be included in the evaluation. Decision makers assign a weighted value to each effect, based on the contribution of the effect to the overall utility of the program. Cost-utility analysis is more challenging to undertake than CEA as researchers must identify ways to assess the value of each effect (Levin et al., 2017).

Economic foundation of CEA. Robbins (1935) defined economics as the "science which studies human behavior as a relationship between ends and scarce means which have alternative uses" (pp. 15-16). Cost analysis, as a tool for economic evaluation, is an outgrowth of three foundations of economic theory: scarcity, rationality,

and optimization (Brewer, Hentschke, & Eide, 2015; Cantor, 1994). Scarcity recognizes that there are insufficient resources to satisfy the needs and desires of all individuals. Rationality refers to systematic and intentional decision-making based on economic circumstances, as well as the ability to adapt decisions to changing circumstances. Optimization assumes that individuals and organizations will make decisions that maximize the opportunity to achieve goals, within existing financial constraints (Brewer et al., 2015).

An economic perspective on education emphasizes actions related to resource allocations (Hanushek, 1979). Rather than focusing on a particular goal, an economic perspective explores how human behavior, decision making, and progress toward a goal are affected by the scarcity of required resources (Robbins, 1935). Chambers (1999) highlighted four educational issues informed by an economic approach: (a) the relationship between resource use and student outcomes; (b) the maximization of outcomes within available resources; (c) the use of cost data for productivity and efficiency improvements rather than reporting; and (d) a focus on the production function. In addition, the field of economics offers methodology for linking data on resource use with data on outcomes (Hummel-Rossi & Ashdown, 2002).

Brewer et al. (2015) recommended three questions benefitted by study through an economic lens:

- How much education should an individual acquire?
- How should education be produced and allocated by a society?
- Can we be more efficient in organizing the production of education? (p. 24)

CEA addresses the last question.

History and use of CEA. CEA developed from multiple disciplines including economics, operations research, and decision analysis (Gift, Haddix, & Corso, 2003). Like benefit-cost analysis, CEA is strongly linked to welfare economics and optimization theory (Garber & Phelps, 1997; Garber, Weinstein, Torrence, & Kamlet, 1996). Welfare economics supports equitable resource allocations that improve the welfare of society and individuals (Dobuzinskis, 2013). Optimization theory reflects decision-making, and the process of choosing the best alternative available to achieve a desired outcome (Chong & Zak, 2013).

CEA originated as an applied engineering tool to aid in the military evaluation of weapons systems in the 1950s and 1960s (Garber et al., 1996; Levin & Belfield, 2015). By the 1970s, applications had expanded to include criminal justice, healthcare, and education (Levin, 2015). In healthcare, CEA is widely used to evaluate alternative health care programs; it is also used by the federal government to prioritize health-related resource allocations (Gift et al., 2003). In addition, the prevalence of CEA studies in healthcare allowed the practice to evolve through repeated examination and refinement (Hummel-Rossi & Ashdown, 2002). For example, in 1993 a panel of 13 experts convened by the U.S. Public Health Service was asked to examine CEA methodology, make recommendations, and establish guidelines (US Department of Health and Human Services, 1996).

The first published study applying CEA to education occurred in 1970 when Dr. Henry Levin compared alternative methods of teacher selection (Levin, 1970). Dr. Levin

went on to define and describe CEA methodology in the 1975 *Handbook of Evaluation Research* (Levin, 1975). He continued to advocate for the use of CEA in educational decision making over the next four decades, and co-authored the 3rd edition of *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* - a seminal text on the use and interpretation of cost analysis in education based on his earlier definitive texts on the same topic (Levin, 1983; Levin & McEwan, 2001; Levin et al., 2017).

Characteristics and components of CEA

Researchers and decision makers must understand the purpose of CEA before committing to a study. After careful design and planning, a study must be rigorously carried out, adhere to methodological guidelines, and combine costs and effects into a single number - the cost-effectiveness ratio. Finally, researchers must be able to interpret and explain the results to the primary audience (usually the decision maker). In addition, limitations and challenges impact the feasibility of a study and help to explain the underutilization of CEA.

Purpose. The purpose of cost-effectiveness analysis is to inform decision making and policy development, promote greater productivity in higher education, and facilitate the most efficient use of public resources (Hollands et al., 2014; Levin et al., 2017). If a decision has already been made there is no reason to perform CEA. Likewise, if meaningful alternatives are excluded due to political or stakeholder preferences, the contribution of CEA to the decision-making process will be limited (Levin et al., 2017).

The return-on-investment of the evaluation process itself must also be considered when contemplating a cost-effectiveness study. Economic evaluations require resources

in funds, personnel, and time. The value of CEA is proportional to the savings anticipated, or the increase in effectiveness expected, by selecting the most cost-effective program. Decision makers must ask themselves, "what is the economic payoff to performing [cost-effectiveness] analysis" and "what will be gained by finding a better alternative?" (Levin et al., 2017, p. 39).

Methodology. Only a brief introduction to CEA methodology will be included here, sufficient to frame the challenges faced by community colleges in incorporating CEA into their decision-making process. For detailed explanations and methodology guidelines, see Levin et al. (2017).

When incorporating CEA, interventions utilizing true experimental design are preferred, with random assignment of participants to control and experimental groups (Barnett, 1993). In addition, effectiveness measures must be well defined and an accurate representation of the objectives of the intervention. The effectiveness measure must also be capable of being expressed as a single number (Belfield, 2015a).

Before beginning a CEA study, the researcher must clarify the analytical framework to be used. This includes defining the problem, exploring the theory of change, identifying the alternatives, clarifying the intended audience, and selecting the perspective for the study. The possible perspectives are:

- social - the social perspective includes all costs associated with an intervention, those borne by the decision-maker and those contributed by other entities, as well as all effects regardless of the beneficiary;

- individual - the individual perspective considers only the costs and benefits sustained by an individual, usually the student; and
- fiscal - the fiscal perspective calculates costs and effects as they relate to an agency or the taxpayer (Levin et al., 2017).

Educational evaluations most often assume a fiscal perspective (Hummel-Rossi & Ashdown, 2002).

The next step is determining program costs. CEA is grounded in the economic concept of opportunity cost - the true cost of a resource is what is lost by not having it available for an alternative use (Lieberman & Hall, 2005). Traditional higher education budget reports, developed primarily to comply with state and federal reporting requirements, are inadequate for determining opportunity cost (Chambers, 1999). They lack the detail necessary to cost out each component of an intervention. Opportunity cost is most accurately determined by the ingredients method, first described by Dr. Henry Levin in the 1975 *Handbook of Evaluation Research* (Levin, 1975). Since its introduction, the ingredients method has been widely accepted as the preferred methodological approach in cost analysis (Barnett, 1993; Catterall, 1998; Harris & Goldrick-Rab, 2010; Ross, Barkaoui, & Scott, 2007). The ingredients method estimates program costs by identifying resources (ingredients) required to implement the intervention, estimating the cost of each ingredient, and then calculating total and average program costs (Levin et al., 2017).

The identification of resources includes *all* resources utilized in an intervention. One way to think of this is to ask "What would be required to replicate the intervention"?

Resources include funds, personnel, facilities, equipment, materials, and even volunteer time. Furthermore, categories such as personnel must include detailed information such as qualifications of personnel, percent of workload dedicated to the intervention, salary and benefits, and any other characteristics that influence the cost. Information on resources may come from interviewing individuals involved in the intervention, reviewing reports, or personal observations (Levin & Belfield, 2015). The most accurate listing of ingredients is obtained when the cost study runs concurrently with the intervention. Identifying resources after a program is completed is challenging; personnel may be difficult to locate, or may not remember all aspects of an intervention (Levin & Belfield, 2015).

Once all ingredients have been identified, the researcher determines the cost of each ingredient. Expenditure budgets may contain some of this information. Other costs may be estimated using regional or national averages. Levin et al. (2017) detail sources and processes for determining costs. Once the ingredient costs are established, total program cost is calculated by multiplying the quantity of each ingredient by its cost. In addition, the researcher calculates the average cost per participant. If a decision maker is interested in scaling up an existing program, the marginal cost can be determined. Distribution of program costs - costs borne by individual funders - may also be of interest to a decision maker (Levin et al., 2017).

The cost-effectiveness ratio. The cost-effectiveness ratio (CER) expresses the relationship between program costs and program effects. The same units must be used for both costs and effects (e.g. per student). The CER is calculated by dividing the costs

of an intervention by its effects, where C_T and C_C represent the cost of the treatment and cost of the control respectively, and E_T and E_C represent the effects of the treatment and the effects of the control (or counterfactual) respectively (Levin et al., 2017).

$$CER = (C_T - C_C)/(E_T - E_C) = \Delta C/\Delta E$$

The effectiveness measure often incorporates the change in effect, expressed as an improvement in achievement or performance. As such, the formula is most commonly expressed as CER = C/E, and represents "the cost required to obtain a single extra unit of effectiveness" (Levin et al., 2017, p. 167). Depending on the preference of the decision maker, the ratio can also be expressed as an effectiveness-cost ratio (ECR) and calculated by dividing program effects by program costs (ECR = E/C). When calculated this way, the ECR indicates the units of effectiveness that can be purchased for a specific investment (e.g. effects per $100 of investment) (Levin et al., 2017).

Interpreting and explaining cost-effectiveness results. The purpose of CEA is to improve resource allocations and policy development; a cost-effectiveness ratio is most useful to decision makers when it is presented in a way that is meaningful and easily understandable. For a comparison between two alternatives to be meaningful, both interventions should be of similar scale, serve similar populations, and have the same outcomes (Levin et al., 2017). In addition, the quality of the outcomes must be comparable (Gnage et al., 2013). Threats to external validity should be acknowledged and considered. It is also important for decision makers to understand that the CER is an efficiency metric - it is a way to understand costs. Levin et al. (2017) explained:

> If the [CER] is $10,000 per one-unit effect size gain...this does not imply

either that $10,000 in additional expenditures is necessary or that the given intervention will yield a one-unit gain in effectiveness. Strictly, it means that an intervention with this CE ratio is twice as cost-effective as an intervention with a [CER] of $20,000. (p. 176)

Cost-effectiveness planes are a visual representation of the cost-effectiveness of alternatives and widely accepted for interpreting cost-effectiveness results (Pedram Sendi & Briggs, 2001). Two axes, representing costs and effects, divide the planes into four quadrants, as shown in Figure 2.1.

Figure 2.1. Cost-effectiveness planes

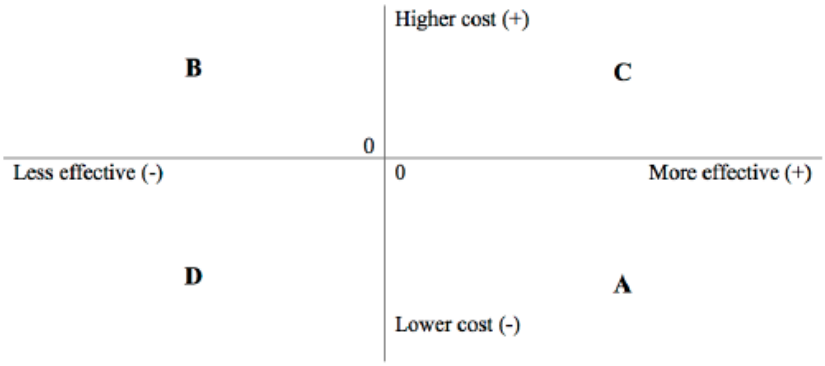


Figure 2.1. Adapted from *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis*, by H. M. Levin et. al., p. 177. Copyright 2018 by SAGE Publications, Inc.

The origin of the graph represents zero cost and zero effectiveness. Interventions falling above the origin are higher cost and those falling below the origin are lower cost. Likewise, those falling to the right of the origin are more effective while those to the left of the origin are less effective (Levin et al., 2017). A *dominant* intervention is both less costly and more effective; these interventions lie in Quadrant A and are superior. A *dominated* intervention is more costly and less effective; these interventions lie in Quadrant B and should be eliminated from consideration. Interventions in Quadrant D have lower cost, but are also less effective. Although not superior, these interventions may be appealing if they are only slightly less effective and a decision maker faces severe financial constraints. For interventions in Quadrant C - those that are more costly and more effective - the value of the intervention is determined by the cost-effectiveness ratio (D. J. Cohen & Reynolds, 2008). In addition, when an intervention is more costly and more effective, the cost of the intervention must be considered in the context of the decision maker's situation - such as funds available and priority placed on increased effectiveness (Barnett, 1993).

Limitations and challenges. There are both limitations to, and challenges in, performing CEA. CEA is inherently comparative; it can only be used to compare alternative programs, not to determine the value of an individual program. As such, CEA is most meaningful when the scale, target population, and quality of alternatives are comparable. Alternative programs must have the same goals, measure the same outcome, use a common scale for measurement, and express the outcome as a single number (Hollands et al., 2014). In addition, methodology introduces uncertainty. *Ex ante* analyses

estimate costs and outcomes before an intervention is implemented. *Ex post* analyses compare actual costs and outcomes after an intervention is completed. *Ex ante* evaluations introduce uncertainty in the estimation of costs and outcomes, while *ex post* evaluations introduce uncertainty through the process of gathering costs after an intervention is completed, particularly when the evaluation occurs years or decades later (Gnage et al., 2013). The various sources of uncertainty in CEA are addressed with sensitivity testing. Sensitivity testing allows the researcher to change the modeling assumptions, particularly those for high cost ingredients such as personnel (Harris, 2009). Values that are more and less conservative are substituted in CEA calculations, exploring whether or not, and how much, different assumptions alter the original ratio (Hollands et al., 2014). CEA cannot be performed with a step-by-step guide; professional judgement is required on the part of the researcher (Levin et al., 2017).

As interest in CEA in education grew in the late 20th century, so did awareness of the difficulties involved in cost analysis. In 1995, the New York State Board of Regents held a symposium to explore "how resources can be used most effectively to foster educational outcomes" (New York State Board of Regents, 1996, p. vii). The panel identified several challenges in the use of CEA: lack of understanding among decision makers regarding how CEA results should be used, conceptual and technical issues in determining costs, and the absence of incentives that could encourage stakeholders and decision makers to incorporate CEA in decision making (Hummel-Rossi & Ashdown, 2002). Higher education institutions face similar challenges - technically, politically, and culturally (Tsang, 1997).

Technical challenges. Technically, institutions may not have access to the financial data required for CEA, or the expertise required to do the analysis. Institutions traditionally generate budget reports that do not disaggregate data at the level of project ingredients. In addition, they may not have software that supports recording and analyzing disaggregated cost information. Nathan Dickmeyer, Director of Institutional Research and Assessment at LaGuardia Community College, recommended that software systems selected for cost analysis should:

- Handle four dimensions of hierarchical codes: source, responsibility, purpose, and description.
- Develop a usable purpose hierarchy, but allow roll-ups for different reporting needs.
- Code identical things identically, across systems.
- Allow easy aggregation of financial information across sources as well as responsibility centers.
- Allow free invention at the bottom level of coding, especially description, but maintain higher levels of roll-up coding. (Dickmeyer, 2013, pp. section 4, para. 1)

Lack of expertise is another technical challenge. There are few training programs in CEA, and graduate programs in educational evaluation seldom include information on cost analysis (Ross et al., 2007). As a result, few institutions have personnel with experience in CEA (H. M. Levin, 2001).

Political challenges. Political challenges come primarily from external sources. Alternatives may be excluded from a cost analysis if they are deemed politically

nonviable, however all alternatives should be included. Political pressures may change over time, creating new opportunities for programs previously excluded from consideration. Furthermore, Levin et al. (2017) note that "...it is a matter of professional integrity to provide information on all of the pertinent alternatives, while letting the decision making and political process eventually determine the choice among them" (p. 30).

Another potential challenge is stakeholder bias (Hummel-Rossi & Ashdown, 2002). Discount rates used in pricing ingredients affect program costs, and can slant a cost analysis for or against an alternative (Gnage et al., 2013). Fuguitt and Wilcox (1999) described how President Nixon used "different discount rates for two separate categories of federal projects...effectively [shaping] all federal cost-benefit analyses produced during his administration" (p. 20).

Cultural challenges. Cultural challenges arise primarily from internal sources. Tsang (1997) observed that cost analysis in education can be a "contentious tool" (p. 323). Faculty may oppose any efforts to prioritize cost reductions, worried that expensive programs they support will be eliminated (Manning & Crosta, 2014). They may also view efficiency efforts as unethical (Gumport, 2000) Members of the campus community may equate declines in funding with declines in quality (Agasisti & Belfield, 2016). Program implementers may prefer not to focus on sustainability concerns. Administrators may choose to discuss costs only rhetorically, avoiding the influence of a detailed cost analysis (Tsang, 1997). And most higher education leaders are not familiar with what

CEA is and what it can do. In addition, they often maintain that quality and effectiveness can only be increased with increased funding (H. M. Levin, 2001; Powell et al., 2012).

The Use of CEA in Higher Education

There has been little incorporation of CEA in higher education decision making, and a paucity of studies. However, interest in CEA from funding agencies, researchers, and college leaders is increasing (Levin et al., 2017). As the need for CEA expands, the use of CEA in higher education will depend on (a) overcoming challenges, following methodological guidelines, and applying an appropriate decision-making framework; (b) creating a database of cost-effective interventions based on rigorous studies; and (c) acknowledging how CEA contributes to the mission and success of 21st century community colleges.

Decision-making framework. Challenges and methodology were discussed in previous sections. This section will focus on the use of CEA in decision-making. CEA is a powerful tool. The contribution of cost information to the decision-making process guides the allocation of new resources as well as the reallocation of existing resources. CEA provides insights during policy development as it connects inputs and outcomes via the education production function (Hanushek, 1979). It is, however, not a tool for mechanistic decision making (Siegel & Clancy, 2003). There are no decision rules that automatically guide the application of CEA to program planning and evaluation. It is the responsibility of the researcher to design the study with the primary audience in mind, and to present the results in a way useful to decision makers (Levin et al., 2017). Decision makers must then consider all relevant variables. In some situations, it may be

more beneficial for a college to select a less cost-effective program as opposed to one with larger effects and equally higher costs (Levin, 2011). In addition, a less cost-effective alternative may be desirable for equity purposes (Harris & Goldrick-Rab, 2010). Ashdown and Hummel-Rossi (2002) note the importance of considering CEA in the context of a decision; social or political factors may be equally or more important than costs. One qualitative benefit of cost analysis is identifying and drawing attention to the many variables that must be considered - for example, how different student groups might be impacted by an intervention (Chambers, 1999).

When CEA is used during times of reduced funding, it should be emphasized that cost-cutting and cost-effectiveness are not the same thing (Heaton & Hirschi, 1999). Cost-cutting reduces funding to departments and/or programs without consideration of the impact on student success. In contrast, using cost-effectiveness data supports strategic reallocation of resources, allowing decision makers to prioritize student success during times of economic hardship.

Harris (2009) proposed the use of cost-effectiveness benchmarks in policy analysis and development. His decision-making framework included two assumptions for policy or program adoption: (a) the same effect cannot be achieved at a lower cost, and (b) decisions are made to maximize outcomes. He also acknowledged that state and local decision makers have fewer policy choices than those at the federal level.

Local decision makers must also consider CEA in the context of their institution. They must evaluate the feasibility of implementing a particular program, including whether or not the resources are available, and the receptivity of faculty and staff (Tsang,

1997). If institutional support from other areas of the colleges is required for program implementation, or funds must be reallocated, the accompanying challenges must be evaluated (Massy, 1996). If the goal is to provide an intervention to all students, and the initial action is establishing a boutique program, the costs of scaling the program must be estimated. Consideration of a program also occurs in relation to the theory of change. For example, a program may be cost-effective in increasing completion of gateway math courses for all students, but achievement gains may be greater for one population of students than another. If the institutional strategic plan prioritizes reducing achievement gaps, another program may be more suitable even if it is less cost-effective. College leaders should also consider the impact of induced costs - what future expenses will be incurred by the achievement gains anticipated from the adoption of a program (Levin et al., 2017).

CEA often illuminates aspects of a decision that might not be evident without CEA. If decision makers select a less cost-effective program for social or political reasons, the cost of the decision will be evident. Excluding such considerations, CEA assumes that decision makers will select those programs that deliver the greatest benefit at the lowest cost (Levin et al., 2017).

Studies. The use of CEA is not widespread in education, and few studies exist (Levin & McEwan, 2001; Monk, 1995). Furthermore, many studies that claim to focus on cost-effectiveness are merely rhetorical. Clune (2002) reviewed 541 abstracts of K-12 productivity studies that referenced *cost-effectiveness*, drawn from those included in the ERIC database between 1991 and 1996. Only two percent of the abstracts indicated using

a resource approach to determine costs. The majority of studies contained little or no data on costs. While interest in cost analysis in education has increased in the 2000s, there are still few cost analysis studies in higher education. The lack of cost studies "impedes the development of a knowledge base of what works in education, which impedes educational policy formation" (Ross et al., 2007, p. 2). Increased use of CEA facilitates the development of a database of cost-effective interventions, similar to the database of rigorous effectiveness studies available at the U.S. Department of Education's What Works Clearinghouse (U.S. Department of Education, n.d.).

Though not strictly cost-effectiveness studies, several researchers focused on community college efficiency and productivity. Agasisti and Belfield (2016) used stochastic frontier analysis to estimate technical efficiency in the community college sector, stating that - to their knowledge - their work was "the first to focus specifically on community colleges" (p. 1). They found that community colleges do not show the economies of scale that exist in the larger higher education sector, that student characteristics common in two-year institutions (high proportion of minority students, more part-time students, and more students over the age of 25) negatively correlated with efficiency, and that community colleges became more efficient over time.

Belfield, Crosta, and Jenkins (2014) modeled the impact of student success programs on revenues and expenditures at one community college. Their simulations reflected the production process, taking a long-term approach based on student course-taking patterns over five years. Economic impacts focused on the induced costs of increasing student progression. Metrics included completions, expenditures, revenues, net

revenues, and efficiency (awards per dollar of expenditure). While cautioning about the generalizability of results from one college to the broader community college sector, they noted that increasing persistence was both expensive and inefficient, merely postponing dropping out for many students, and increasing costs per completion. They further observed that, based on their results, increasing community college completions is expensive, and it will be difficult for two-year institutions to sustain efficiency improvements.

Bailey (2012) examined the importance of student persistence and improving intermediate outcomes to increasing community college graduation rates, and noted that increasing enrollments of previously unenrolled students would be very costly. Considering the potential of student success interventions to increase completion of enrolled students, he observed that specialty interventions targeted to small student populations lacked the impact required to significantly increase completions. Such programs would have to be delivered to a much larger student population, and the costs involved would be very challenging.

Belfield (2015b) focused on resource reallocation, and considered how increasing part-time faculty, college size, and class size might impact efficiency. Noting the scarcity of research on these issues, his review of existing studies suggested that further research was warranted on the impacts of faculty productivity and class size on efficiency.

Brown and Belfield (2002) used existing studies on the effectiveness of instructional mode in postsecondary student learning as a resource base for CEA. Adding estimated cost data to extant effectiveness data, they compared five instructional modes -

lectures, personalized instruction, discussion/enquiry, independent study, and "other" (various methods) - to assess the cost-effectiveness of lecture delivery. They found that no method was consistently more cost-effective than lectures. The authors acknowledged that CEA is most accurate when effectiveness data and cost data are collected simultaneously. However, in light of the dearth of CEA studies in higher education, they comment that their process can facilitate the development of a CEA literature base and provide generalizable results regarding cost-effective practices.

Hollands and Tirthali (2014) estimated the cost-effectiveness of MOOCs compared to other online delivery modes. They found that while MOOCs are more costly to develop and deliver, the cost per completer is probably lower than traditional online courses due to the increased reach of a MOOC. The authors acknowledged that student learning would be a better effectiveness metric for CEA than course completion, but observed that there are few peer-reviewed studies comparing student learning in MOOCs and other online courses. In addition, they stressed the need for further research, commenting that "it is perplexing that MOOCS have taken hold without much evidence as to whether they are effective…and without a firmer idea of their economic value, resource requirements, and costs" (p. 116).

Harris and Goldrick-Rab (2010) observed that few student success strategies were cost-effective, while those that were cost-effective were underemployed. The authors believed productivity improvement is possible, but acknowledged the challenges that exist when "a lack of rigorous evidence about both the costs and effects of higher education practices intersects with a lack of incentive to use cost-effectiveness as a way

to guide decision-making" (p. 1). Using extant effectiveness studies and estimated costs, they found increasing the use of call centers (largely due to their low cost) and online learning to be promising as cost-effective practices. Furthermore, their results suggested that many popular strategies, including college access programs, financial aid, and enhanced student services improved graduation rates, but not above current productivity levels. They concluded that "the absence of the type of information that would be needed to improve productivity…is perhaps the strongest evidence that we are falling short of our productivity potential" (p. 41).

Belfield, Jenkins, and Lahr (2016) estimated the cost-efficiency of corequisite remedial math and writing at 13 community colleges in Tennessee, compared to the traditional model that required completion of remedial courses before enrollment in gateway courses. The Tennessee colleges scaled corequisite remediation in Fall 2015, placing remedial students directly into the gateway college course with corequisite enrollment in the remedial course. For math pathways, the corequisite model was more expensive than the prerequisite model - $786,000 for a cohort of 400 students, compared to $382,100 for the prerequisite pathway. However, success rates were much higher with the corequisite pathway than the traditional pathway (51% and 12% respectively), leading to a lower cost per successful student with the corequisite pathway than the traditional pathway ($3,840 and $7,720 respectively). The authors commented that initial implementation costs could be problematic for colleges whose funding depends on past performance, and noted additional managerial challenges such as cultural changes and faculty support. They also acknowledged that broad innovations, such as guided

pathways, implemented at the same time as corequisite remediation may have influenced increases in student success.

The most extensive applications of CEA to student success interventions involve the Accelerated Learning Program (ALP) at the Community College of Baltimore County (CCBC) and the Accelerated Study in Associate Programs (ASAP) at the City University of New York (CUNY). The Community College Research Center (CCRC) at Teachers College, Columbia University, responded to a request from the CCBC to complete a quantitative evaluation of the ALP to assess both effectiveness and efficiency. The ALP was implemented in Fall 2007 with 10 sections and 80 students. Students who tested at the upper level of remedial English were enrolled in both English 101, the first course in the college-level English sequence, and a corequisite ALP companion course that met immediately after the gateway course, taught by the same instructor. The goal of ALP was to increase completion of the English sequence - English 101 and English 102.

Jenkins, Speroni, Belfield, Jaggars, and Edgecombe (2010) found that ALP was more efficient and more effective than the traditional pathway. In measuring effectiveness, 82% of ALP students passed English 101 within one year, and 69% passed English 102. In contrast, 35% of traditional students passed English 101 within one year, and only 12% passed English 102. The authors noted that their findings established a correlation between ALP and increased completion of the college English sequence; causation could not be established due to possible selection bias. In measuring efficiency, they found ALP was more costly to implement than the traditional pathway, however the cost per successful student was lower - $2,680 for ALP students vs. $3,122 for traditional

students, making ALP a cost-effective solution. For a cohort of 250 students, they estimated the college would save $40,400 by enrolling them in the ALP pathway. One further finding highlighted the contextual role of cost-effectiveness in decision making. The authors found that ALP met the goal of increasing English 101 and 102 completion, however it did not lead to increased completion of other courses, or increased persistence. Decision makers must consider all variables when evaluating cost-effectiveness results.

ASAP began in 2007 with funding from the New York City Center for Economic Opportunity and a goal to increase the three-year CUNY community college graduation rate to at least 50% (from an average of 25%). Barriers to graduation were identified, including inconvenient course scheduling, conflicting personal responsibilities, and the need for advising and academic assistance. In response, ASAP provided students with financial help (tuition and fee gaps were waived), consolidated scheduling, cohorts, tutoring, and career guidance (Linderman & Kolenovic, 2009). Participating students were required to be college ready, and to attend full-time. The results were impressive; over 50% of the initial cohort (1,132 students) graduated with an associate degree within three years.

Researchers at the CBCSE, in collaboration with CUNY administrators, studied ASAP for cost-effectiveness over three years (Levin & Garcia, 2012). The initial Fall 2007 cohort across six community colleges was evaluated against a Fall 2006 comparison group. ASAP was more costly than the traditional program; the three-year average cost per FTE for ASAP was $49,358, while the three-year average cost per FTE for the comparison group was $29,521. However, the increased student success rate made ASAP

more cost-effective. The average cost per graduate for ASAP was $57,297, compared to $63,656 for the comparison group - a cost savings of $6,359 per ASAP graduate (Levin & Garcia, 2012).

Contributions of CEA to the mission and success of community colleges in the 21st century. Envisioning the future of CEA in community colleges includes consideration of why CEA is needed, how CEA contributes to the community college mission, and what needs to happen for CEA use to increase.

Why CEA is needed. Cost-effectiveness analysis adds value to higher education decision making by defining the relationship between costs and effects in the education production function, linking spending to outcomes, and guiding the efficient use of public resources. In addition, CEA:

- identifies practices that are not worth their cost;
- demonstrates the benefits in moving resources from less cost-effective programs to more cost-effective programs;
- improves the quality of college conversations about student success;
- helps colleges identify the factors that contribute to program costs;
- helps institutions estimate the costs required to scale effective interventions;
- establishes institutional benchmarks that allow institutions to measure progress in efficiency, productivity, and effectiveness over time;
- links strategic planning with financial planning;
- supports institutional leaders in determining if investments in student success are paying off;

- demonstrates institutional efforts and progress to governing boards and legislators; and
- allows colleges to assure grant-makers that funds will be available to maintain a successful program after grant funds expire.

When colleges depend on traditional budget reports for cost information, it is not possible to discern necessary costs from wasteful expenditures (Monk, 1995). Pinkerton et al. (2002) observed: "In a world of unlimited resources, cost-effectiveness would be a moot concern. However, when resources are constrained, as they are in most real-world circumstances, difficult choices must be made..." (p. 71). CEA informs difficult choices.

How CEA contributes to the community college mission. Community colleges have become more efficient over time, but there is still room for efficiency gains, and continual opportunities to "spend efficiently or wastefully" (Agasisti & Belfield, 2016, p. 3). Managing resources wisely is critical for institutions struggling to serve increasing numbers of underprepared and at-risk students, to improve quality of life and future opportunities for previously underserved populations, and to contribute to future workforce needs of communities, states, and the nation. In addition, colleges would benefit from a database of cost-effective practices - a database that does not yet exist. Dr. Karen Stout, past president of Montgomery County Community College and current president of Achieving the Dream, observed that while colleges have robust practices allowing them to respond to market needs, they lack equally effective processes for analyzing costs in a way that would lead to improved performance. She also commented

on the challenges that exist in reaching significant numbers of students with student success interventions:

> "While we have been historically successful at adopting interventions such as online learning, dual enrollment, workforce preparation, and remedial education, we have not been successful at bringing these innovations fully to scale. We are, therefore in the midst of an 'unfinished revolution.'" (Sydow & Alfred, 2013, p. ix)

Cost-effectiveness analysis is uniquely positioned to provide the data needed to fill these gaps.

Levin et al. (2017) discussed two trends in higher education that may lead to a heightened interest in, and need for, CEA. First, it is increasingly important for colleges to allocate resources efficiently, and to provide evidence of wise fiscal decision making. Volatility in public funding will continue, as will the financial pressures on public higher education institutions (Doyle & Delaney, 2009). Unless CEA is included in program planning and evaluation, colleges have no way of knowing if they are using resources efficiently (Barnett, 1993). Second, society increasingly expects higher education to reduce inequity, demands on welfare programs, and vacancies in the workforce. This is particularly challenging in light of demographic changes - and the historic inattention to educational equity gaps - that created community college enrollments with a majority of underprepared students (Levin, 1989). Wellman (2010b) observed that the interest of college leaders in cost data increased when demands for accountability increased. CEA has the potential to become an invaluable asset to 21st century community colleges:

capable of estimating scalability before a program is implemented, revealing which programs will deliver the greatest student success benefits at the lowest cost, and providing decision makers with the evidence needed to make efficient and effective decisions.

Increasing the use of CEA. Many researchers have recommended that higher education utilize cost-effectiveness analysis to increase student success, efficiency, and productivity (Harris & Goldrick-Rab, 2010; Levin et al., 2017). Increasing the use of CEA in community colleges requires identifying potential barriers and solutions, and incorporating the recommendations of CEA researchers.

Barriers previously reviewed include the absence of accounting practices that support CEA, insufficient expertise on college campuses necessary to undertake the analysis, inadequate software for generating the required data, and a lack of awareness among college leaders and decision makers regarding the value of CEA (H. M. Levin, 2001). In addition, funding agencies and governing boards seldom request or require cost studies (Levin & McEwan, 2001). Furthermore, the cost of CEA is substantial. Dr. Clive Belfield commented that a study can take several years and require several hundred thousand dollars to complete (personal communication, May 25, 2018). This study will explore the perceptions of CEA held by college leadership, and investigate the barriers that impede institutional use of CEA.

A community of higher education advocates and researchers believe community college efficiency and productivity can improve (Harris & Goldrick-Rab, 2010; Jenkins & Belfield, 2014). CEA is a valuable tool in facilitating such improvements. Increasing

the use of CEA will require leadership from funding agencies, governing boards, college administration, and faculty, as well as overcoming implementation barriers mentioned previously. In addition, researchers have suggested the following to increase the use of CEA in higher education:

- including funds to cover the collection of cost data in funding agency requests for proposals;
- grant makers requiring cost data;
- offering incentives;
- increasing the availability of training programs;
- adding courses on cost analysis to graduate programs;
- increased attention to costs and efficiency from higher education governing boards;
- institutional tracking of ingredient costs at the program level and the course level; and
- running cost analysis studies concurrently with program implementation (Harris & Goldrick-Rab, 2010; Levin et al., 2017; Manning & Crosta, 2014; Ross et al., 2007).

In addition to exploring barriers to the institutional use of CEA, this study sought to identify potential solutions, and contribute to the increased use of CEA in community colleges.

Summary

This chapter reviewed the literature behind three forces that created a critical need for CEA - the evolution of a completion agenda, challenges in higher education financing, and 21st century pressures for increased efficiency and productivity in the community college sector. The CEA literature was also reviewed, including a description of what CEA is and what it can do; extant studies on productivity, efficiency, and CEA use; and the need for CEA in higher education decision making. Chapter Three introduces the methodology for this study, and describes the research design that was used.

Chapter Three: Methodology

Chapter Three describes the methodology and research design used in this qualitative study. The study was conducted in two phases - Part One and Part Two. Part One was an investigation of the requirements, challenges, and recommendations for the use of cost-effectiveness analysis (CEA) in community colleges. Part Two began as a grounded theory study on effectiveness and efficiency in community college student success programs and the potential role of CEA in such efforts. The initial focus of the study changed during data analysis, a common development when using grounded theory methodology (Holton & Walsh, 2017). The purpose, research questions, methodology, and research design for Part One and Part Two are presented separately. Part Two also discusses validity, delimitations, and positionality.

Part One

Purpose of the Study

The purpose of Part One was to explore the potential use of CEA in community colleges, and assess the possibility for individual institutions to implement CEA using only their own resources, without contracting an external study. The results of Part One were also needed to inform Part Two; research question three in Part Two asked: "How do community college leaders perceive CEA and its potential role in promoting efficiency and effectiveness in student success programs?" Before asking college leaders how they perceived CEA and its potential use at their institution, it was necessary to first establish whether or not CEA could be used by institutions for internal decision making.

Research Questions

1. What is required for CEA to be implemented at community colleges?

2. What challenges exist at community colleges for the implementation and use of CEA?

3. How can these challenges be addressed?

Methodology

Part One was an investigative study. Qualitative methodology was used to gather data through interviews and observation.

Research Design

Participant selection. Purposeful sampling and snowball sampling were used to select participants with expertise in, or experience with: CEA methodology, CEA studies, institutional research offices at community colleges, community college infrastructure related to student success program evaluation, and data analytics. Eleven individuals participated in the study - four educational researchers; five community college presidents, vice presidents, or executive directors responsible for institutional research; and two student success advisors associated with national student success networks.

Data collection. Data were collected through observation and interviews.

Observation. The Center for Benefit-Cost Studies of Education Methods Training course, held at Teachers College, Columbia University, was observed in May 2017. The course provided instruction and practice in the use and application of CEA and benefit-cost analysis methodologies. *Economic Evaluation in Education: Cost-Effectiveness and*

Benefit-Cost Analysis (Levin et al., 2017) was the text for the course, and was used extensively throughout this study as a reference.

Interviews. Unstructured and semi-structured interviews were used in data collection. Unstructured interviews allowed participants to talk freely about their experiences with CEA, institutional research, or data analytics. Semi-structured interviews "allow the researcher to respond to the situation at hand…and to new ideas on the topic" (Merriam & Tisdell, 2015, p. 111). There are no published studies on the feasibility of CEA use by individual colleges, therefore this was an investigative study; a structured interview approach was not suitable.

In addition to the participants selected for Part One, interview data from participants in Part Two were incorporated when applicable. Part Two participants included community college leaders - Chancellors, Vice Chancellors, Presidents, and Vice Presidents - from 14 colleges in six states.

Data Analysis. Interviews were recorded, transcribed, and coded by hand and with MAXQDA software. The answers proposed for the research questions, concluded from the study, were validated by educational researchers who participated in the study.

Limitations

Limitations included a small sample size due to time constraints. CEA has been used in healthcare for decades. Healthcare researchers could have been included in the sample. The small sample of student success network advisors was also due to time constraints.

Part Two

Purpose of the Study

The purpose of Part Two was to explore efficiency in community college student success efforts, including how leaders use cost data in decision making. Part Two also sought to understand how leaders perceive CEA and its potential use at their institution. The purpose of the study changed as data collection and analysis progressed. It was assumed, prior to beginning the study, that efficiency was a priority for community college leaders, and that cost data was used in decision making. However, the data revealed that cost data and efficiency considerations were not a priority. Executive leaders focused first on student success; costs were seldom considered outside of cost feasibility. As a result, the purpose of Part Two changed to understanding how community college leaders worked to increase student success, and how CEA might fit into their efforts.

The goal of Part Two was the development of grounded theory. Gregor (2006) defined theories as "abstract entities that aim to describe, explain, and enhance understanding of the world and, in some cases to provide predictions of what will happen in the future and to give a basis for intervention and action" (p. 616). A formal grounded theory is abstract, and generalizable (Corbin & Strauss, 2008). In contrast, a substantive grounded theory applies to a particular area of interest, and is "particularly useful for addressing questions about process" (Merriam & Tisdell, 2015). The goal of this study was to develop a substantive grounded theory explaining how college leaders perceive the link between spending and outcomes, approach effectiveness and efficiency in student

success programs, and the potential role of CEA in the process. As mentioned earlier, the study evolved as data analysis revealed that efficiency was not a main concern of college leaders. As a result, the goal of the study changed to proposing a substantive grounded theory describing how community college leaders worked to increase student success.

Research Questions

The original research questions for the study were:

1. How do community college leaders perceive - and if applicable, assess - the link between institutional spending and student success?
2. How do community college leaders perceive and pursue efficiency and effectiveness in student success programs?
3. How do community college leaders perceive CEA and its potential role in promoting efficiency and effectiveness in student success programs at their institutions?

Methodology

Grounded theory, a form of qualitative research, was the methodology chosen for this study. In selecting a methodology, Stake (2010) advised "first the question, then the methods" (p. 72). Because little is known about the use of cost data or CEA at community colleges, a flexible and exploratory methodology was needed. Grounded theory was the form of qualitative research most appropriate for these requirements. In addition, it is uniquely effective in exploring areas where extant studies are not available and initial research is required to understand what is happening (Corbin & Strauss, 2008).

Grounded theory explains, rather than describes, what is happening (Holton & Walsh, 2017). It is a "systematic process including sampling, coding, and memoing; it is based on data rather than impressions; and…is a complete methodology" (J. W. Jones, 2009, p. 31). Originally introduced by Glaser and Strauss in 1967, it was conceived as an alternative to methodologies that tested extant theories and hypotheses. Grounded theory recommends the researcher begin with a general idea - an area of curiosity - rather than specific research questions (Glaser & Strauss, 1967). Different forms of grounded theory were proposed in subsequent years, primarily by Corbin and Strauss (Corbin & Strauss, 1990) and Charmaz (Charmaz, 2017). The original methodology is often referred to as classic grounded theory and continues to be advocated by Glaser (Glaser, 1978, 2016).

While Glaser recommended against beginning a study with research questions, Corbin & Strauss (1990) suggested that research questions can be used, as long as they are open ended and avoid making assumptions. Both Glaser (1978) and Corbin & Strauss (1990) acknowledged that evolution of interview direction and data collection can occur as research progresses; emerging concepts and theoretical sampling may dictate directions not originally anticipated by the researcher.

The role of the literature review in grounded theory methodology is also controversial. In classic grounded theory, a preliminary literature review is not recommended. Glaser and Strauss (1967), in their seminal text introducing grounded theory, advised researchers to "ignore the literature of theory and fact on the area under study, in order to assure that the emergence of categories will not be contaminated by concepts more suited to different areas" (p. 37). In addition, Holton and Walsh (2017)

observed that grounded theory is often used to explore areas where there is little or no literature, making a literature review both unnecessary and problematic. Instead, the literature review is conducted later, after emergence of a core category. In contrast, Corbin and Strauss (2008) maintained that a preliminary literature review can inform the area of interest, and guide initial sampling efforts as well as support later theoretical sampling.

This study is designed primarily around classic grounded theory methodology, while incorporating some elements recommended by Corbin and Strauss - specifically research questions and a literature review (Corbin & Strauss, 2008). A preliminary literature review was conducted due to the technical complexity surrounding the area of interest. The literature review provided greater understanding of how *productivity* and *efficiency* are defined economically, and how they are applied practically in higher education. This allowed more accurate memoing of conversations with researchers and higher education leaders, and facilitated coding the data. Data analysis and theory development, however, followed the classic grounded theory methodology recommended by Glaser (1978) and described by Holton and Walsh (2017).

Research Design

This section discusses sampling, participant selection, data collection, data analysis, validity, positionality, and delimitations.

Sampling. This study used theoretical sampling. Theoretical sampling is common to all grounded theory methodologies. It is used in research that explores unfamiliar areas, where little is known and all participants cannot be identified ahead of time

(Ritchie, Lewis, & Elam, 2003). Initial participants are selected based on participant knowledge of, or relevant experience in, the area of interest (Merriam & Tisdell, 2015). As collected data is analyzed, emerging concepts guide selection of additional participants "determined only by the necessity of theoretical relevance and coverage" (Holton & Walsh, 2017, p. 40). Identifying "theoretical relevance" requires that data collection and data analysis occur in an iterative fashion.

Theoretical sampling continues, a constant mix of data collection and data analysis, until theoretical saturation is reached. Theoretical saturation occurs when new data fail to add unique concepts. The number of interviews is determined by the number required to reach saturation, as well as limitations on the researcher's resources (Merriam & Tisdell, 2015).

Participant Selection. The sample for Part Two was community college executive leaders - Chancellors, Vice Chancellors, Presidents, and Vice Presidents - at colleges that were, or had been, participants in national student success networks and were actively involved in student success initiatives. Originally, sampling was limited to college leadership in one state. However as data analysis progressed, sampling was expanded until saturation was achieved. Twenty-six leaders from 14 colleges in six states participated in the study.

Data collection. Classic grounded theory utilizes primarily unstructured interviews (Holton & Walsh, 2017). Unstructured interviews are exploratory, and ideal in situations where there is inadequate information to develop semi-structured or structured interview questions (Merriam & Tisdell, 2015). Data collection for Part Two involved

unstructured interviews for research questions one and two, and semi-structured interviews for research question three. Interviews were recorded and transcribed. Additionally, classic grounded theory methodology often recommends re-interviewing as a valuable type of theoretical sampling. Due to the professional demands and limited time of the participants in this study, re-interviewing was not possible.

Data analysis. Data analysis in classic grounded theory begins after the first interview, and occurs continuously with subsequent interviews via the constant comparative method (Holton & Walsh, 2017). Holton and Walsh (2017) described how data is conceptualized through grounded theory coding:

> The conceptualization of data through coding and memoing is the foundation of [grounded theory] analysis, the goal being the discovery of a latent pattern of social behavior that explains a main issue or concern within an area of research interest. This latent pattern analysis approach unravels the complexity in a social setting to reveal a main concern motivating predictable action….[Grounded theory] focuses on one issue - a main concern - and the pattern of behavior that explains how that concern is perpetually processed, managed, or resolved.

Grounded theory coding occurs in two phases: substantive coding and theoretical coding. Substantive coding begins with open coding, and then progresses to selective coding (Holton & Walsh, 2017). In open coding, interview memos are coded line by line, labeling incidents for every possible concept. Glaser's (1978) recommended questions were used in Part Two as a guide during coding:

- What are these data a study of?

- What category or property of category does this incident indicate?
- What is actually happening in the data?
- What is the issue facing the participants?
- What is their main concern, and how do they manage or resolve it?

During open coding, incidents are compared to incidents, and then to emerging concepts, until the main concern is identified, recognized based on its centrality, frequency, and relevance (Glaser & Holton, 2004). Additionally, the pattern of behavior that participants use to address their main concern, referred to as the core category, is also identified. Once a main concern and core category emerge, selective coding begins, limiting future data collection and analysis to the core category (Holton & Walsh, 2017). Data collection and selective coding continue until saturation is realized.

Theoretical coding begins after saturation. Theoretical coding compares memos produced during substantive coding, analyzing the core category and its relationship to other categories "until a pattern emerges that organizes the concepts as a theoretical model with full explanatory power of the main concern" (Holton & Walsh, 2017, p. 77).

The main concern that emerged in this study was increasing student success. Initially, two categories seemed equally prominent as possible core categories - seeking alignment and managing change. However, as data analysis continued, seeking alignment emerged as the most consistent explanation of how participants worked to increase student success. Managing change emerged as a property of seeking alignment, influencing how participants sought alignment and the strategies available to them.

Validity

Validity addresses credibility, or trustworthiness, in qualitative research. Validity is supported by processes such as triangulation, peer review, member checking, and external audits (Glesne, 2011). Glaser and Strauss (1967) insisted that such measures of validity were redundant in classic grounded theory, asserting that the constant comparative method of data analysis provided continuous validation. This position was further emphasized by Holton and Walsh (2017): "Concept validity is established through the interchangeability of indicators in multiple incidents. This means that although incidents are different, they indicate the same concepts" (p. 79). As a classic grounded theory study, the constant comparative method was accepted as a measure of validity.

Delimitations

Delimitations are choices made by the researcher that limit a study. Delimiting factors in the design of this study included:

- Site selection: Sampling was limited to community colleges that are, or have been, members of national student success networks and were active in student success efforts. Further research could include a broader cross-section of community colleges.
- Participant selection: Sampling was limited to community college executive leaders. A heterogenous sample might have included trustees, mid-level managers, faculty, and legislators. Holton and Walsh (2017) recommended beginning with one subset of a sample when different subsets may have different main concerns. Subsequent research could explore additional subsets.

- Methodology: Delimiting is inherent in grounded theory methodology. The constant comparative method of analysis leads to evolving delimitations as a grounded theory study progresses (Glaser & Strauss, 1967; Holton & Walsh, 2017). Early comparison of incidents to incidents and then incidents to categories narrows the research direction as category properties become relevant or irrelevant to the emerging theory. As coding continues, the categories for coding are delimited and irrelevant categories are abandoned.

Positionality

My interest in CEA evolved during cohort visits to community college campuses, an apprenticeship with the Center for Community College Student Engagement, and an internship at a community college. In each instance, I observed successful institutional efforts to identify and implement programs to improve student success. CEA seemed a logical next step to support these efforts. However, aside from the few published CEA studies of community college interventions, it did not appear that CEA was being used nationwide in student success programmatic decisions (Jenkins et al., 2010; Levin & Garcia, 2012). This focused and defined my area of interest - the use of CEA to promote student success in community colleges.

As a community college faculty member and administrator, I participated in student success program implementation and evaluation, as well as budget management. This informed my understanding of community college processes, priorities, and challenges in improving student success - all of which were helpful in this research project. My personal and professional perspective prioritizes both efficiency and

effectiveness, and supports the optimization of resources to promote equity in educational opportunities. I recognize that others may view student success differently.

As a researcher, I view the world through a post-positivist and constructionist paradigm. However, grounded theory methodology is not limited to any particular paradigm, and requires only that the researcher approach a study without preconceived notions, open to all perspectives and concepts that may emerge. (Holton & Walsh, 2017). In addition to my personal paradigms, I brought several assumptions to this study. I assumed that CEA, although complex, could be implemented by colleges. I also assumed that if CEA was available to college leaders, they would select the most cost-effective program (within cultural and political realities). Furthermore, I assumed that college leaders would connect the dots between spending and results if practical methods were available. My assumptions may have biased the questions I asked during interviews, and my interpretation of participant responses, which in turn may have affected my follow-up questions. Additionally, unintentional biases may have influenced how I coded the data, identified the main concern and core concept, and pursued theoretical sampling.

Summary

This chapter described the methodology used in Part One and Part Two of the study. Part One was an investigative study that sought to evaluate whether or not CEA can be used by individual colleges. Part Two was a grounded theory study initially designed to explore the role of efficiency in community college student success programs. The purpose of Part Two changed when data analysis revealed that efficiency was not a main concern of community college leaders. Instead, the main concern of

community college leaders was increasing student success. The focus of Part Two shifted to exploring how community college leaders work to increase student success, and how CEA might fit into their efforts. Chapter Four presents the findings for Part One, and Chapter Five presents the findings for Part Two.

Chapter Four: Findings - Part One

This chapter presents the findings for Part One - a qualitative study exploring the use of cost-effectiveness analysis (CEA) in community colleges. CEA is a cost analysis tool that combines costs and effects to compare alternative interventions that have the same outcome, producing a cost-effectiveness ratio (CER) that demonstrates which alternative produces the greatest outcomes for the lowest cost. CEA is not currently used by individual community colleges; the few published CEA studies of community college programs were contracted through, and completed by, external researchers - including the Center for Benefit Cost Studies of Education (CBCSE), the Community College Research Center (CCRC), and MDRC. Part One seeks to determine if CEA can be done by community colleges using their own internal resources. *Community colleges* includes individual colleges, college districts, and state college systems.

Data were gathered using unstructured and semi-structured interviews. Participants were selected based on their expertise in or experience with: CEA methodology, CEA studies, community college administration and infrastructure, institutional research, and data analytics. Eleven individuals from varied backgrounds were interviewed, including four university/private educational researchers (referred to as Researcher #1, #2, #3, and #4); five community college presidents, vice presidents, or executive directors responsible for institutional research (referred to as Administrator #1, #2, #3, #4, and #5); and two members of national organizations that promote student success and provide support and advising to community colleges (referred to as Advisor #1 and #2). *They* is used in place of *he* or *she* to maintain the anonymity of participants.

In addition, interview data from Part Two were included when relevant to the use of CEA in community colleges. Part Two interview participants - Chancellors, Vice Chancellors, Presidents, and Vice Presidents - were selected from 14 community colleges active in national student success networks in six states.

Interview questions varied depending on the role or involvement of the participant. Part One interviews were recorded, transcribed, and coded by hand and with MAXQDA. Part Two interviews were also recorded, transcribed, and coded by hand and with MAXQDA.

This chapter is organized in four sections: overview, findings, discussion, and summary.

Overview

Purpose of the Study

The purpose of Part One of this study was to assess the feasibility of CEA use in individual community colleges by exploring what is required for colleges to implement CEA, what challenges they might encounter, and whether or not - and how - such challenges might be addressed.

Research Questions

1. What is required for CEA to be implemented at community colleges?
2. What challenges exist at community colleges for the implementation and use of CEA?
3. How can these challenges be addressed?

Findings

As previously mentioned, the few published CEA studies in higher education have been done by researchers at CBCSE, CCRC, and MDRC; these were contracted studies, and will be referred to as *expert* studies. The methodology for expert studies is presented in *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017) and summarized in Chapter Two of this document. Part One seeks to understand whether or not CEA, and the processes described by Levin et al. (2017), can be adapted for use by community colleges. The findings are organized by research question. *Program* and *intervention* are used interchangeably to refer to discrete student success interventions.

Research Question One

Research question one: What is required for CEA to be implemented at community colleges?

Before CEA is considered, a college must determine whether or not cost analysis will inform a decision. CEA is warranted only if it will be useful to the decision-making process. If alternatives are not being considered, or if political or social considerations are the primary concern in selection of a student success intervention, there is little value in doing CEA. In addition, the potential benefit of CEA must exceed the investment required for a study. For potentially costly interventions, or high impact decisions, the benefits of CEA outweigh the effort required; "the more costly the intervention is to implement, the more likely it is that an economic evaluation will pay for itself by changing the allocation of resources" (Levin et al., 2017, p. 40).

If it is decided that cost analysis adds value to a decision, the process of CEA requires:

1. establishing a framework;
2. calculating intervention costs;
3. measuring intervention effects;
4. calculating the cost-effectiveness ratio (CER); and
5. interpreting results.

Once CERs are calculated, the results are interpreted and framed for the intended audience or decisionmaker.

The stages of CEA are the same, whether completed by an experienced researcher or a community college. However, the precision with which each stage is executed can be relaxed for internal decision-making when external validity is not a concern. This allows the process to be simplified and adapted for use in community colleges (see *Appendix C: CEA Checklist*).

Colleges will still require resources and expertise to implement CEA. To successfully complete each stage, the following resources and competencies are needed.

Resources:

- *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017) for use as a guide and reference.
- Access to CostOut - an online tool developed by the CBCSE to support cost analysis.

- A template or spreadsheet for recording intervention ingredients and prices and calculating total intervention costs.
- An institutional research (IR) office, or equivalent, with the time and resources to evaluate an intervention's effectiveness.
- One or more personnel who can: (a) devote a portion of their workload to CEA, and (b) develop expertise in CEA over time by attending trainings and referring to *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017).
- Cooperation and collaboration between: IR offices, budget offices, academic affairs, student services, and any other offices with knowledge of, and information about, the programs being evaluated.
- A campus culture that supports strategic use of financial data to improve student success.
- Support of the institution's executive leadership.

Competencies - the ability to:

- Identify a student success problem (e.g. low student persistence).
- Set a clearly defined goal (e.g. increased persistence).
- Identify alternative solutions - interventions already implemented or being considered for implementation - that are designed to accomplish the goal. An intervention can also be compared to a counterfactual.

- Identify all resources used in an intervention. Identify the quantity of each resource used.
- Assign individual prices to each resource and calculate total costs.
- Measure intervention effectiveness using a single effectiveness metric.
- Calculate the CER.
- Use sensitivity testing.
- Interpret CEA results for the intended decision maker.
- Use CEA for decision making.

Additional details are provided in later sections. The next section will present the findings on the challenges community colleges may face in implementing CEA.

Research Question Two

Research question two: What challenges exist at community colleges for the implementation and use of CEA?

While some stages of CEA present only minimal challenges for community colleges, others represent substantial challenges. The findings for research question two are organized under each of the five stages of CEA

1. establishing a framework;
2. calculating intervention costs;
3. measuring intervention effects;
4. calculating the cost-effectiveness ratio; and
5. interpreting results.

A final section presents general challenges identified during interviewing.

Establishing a framework. Establishing a framework for CEA includes defining a student success problem and a goal, identifying alternative solutions, and clarifying the audience for the analysis. Defining the problem and identifying alternatives are components of a *theory of change.* The theory of change guides institutional actions, explaining how and why the college believes a specific intervention will improve an identified student success problem, and connecting the desired outcomes of an intervention with the college's long-term goals. Specifying a perspective is also part of establishing a framework, however as colleges new to CEA will likely choose a financial perspective for internal decision making, specifying a perspective was not part of this study.

Defining a problem and a goal. Defining a problem and a goal is necessary before a college can identify alternatives as potential solutions. All colleges interviewed for Part Two of this study defined a student success problem before selecting an intervention, however they did so with varying degrees of precision, and did not always identify a specific goal. Some had formal processes in place for proposing interventions that required defining a problem and a goal. Others implemented interventions in response to perceived student needs, without a formal process to state the problem or specify a goal, other than general improvement. For example, an intervention might be implemented to increase at-risk student engagement without defining exactly what student engagement means, or how it will be measured.

This is particularly challenging for colleges just beginning to use data analytics in their student success efforts. Data analytics require that interventions be based on a

theory of change with clear success metrics established in response to a problem and a goal. Interventions, however, are not always selected in response to a problem and a goal. Advisor #2 commented that "…there are things that they just, you know, they're going to do it because it's what's being done nationally, but they might not really know whether it's going to answer any of their issues and problems." The casual implementation of interventions is a significant challenge for colleges desiring to use CEA.

Identifying alternative solutions. Once the problem is defined and an outcome goal established, all recognized alternatives should be considered. Consideration of alternative programs occurred frequently among the colleges interviewed in Part Two, but in varying degrees, and sometimes not at all. Program selection usually depended on whether or not the college believed a program would work for their students, based on anecdotal or empirical indications of effectiveness. If a program was believed to be promising, it might be selected without serious evaluation of alternatives.

College leaders interviewed in Part Two described learning about new interventions at national conferences, from peer institutions, or from non-profit educational organizations. Faculty innovation and committee proposals were another frequent source of intervention ideas. A few colleges had detailed processes for considering interventions that included defining the problem, describing the proposed solution, specifying metrics for evaluation, and addressing implementation details. However, they did not always require that alternatives be identified. While most colleges indicated that they considered alternatives, few had a rigorous or clearly defined process for identifying and evaluating alternatives prior to selecting an intervention.

Clarifying the audience. Clarifying the audience should not be difficult for colleges. External researchers frame a CEA study to meet the needs of their intended audience or the contracting organization. Community colleges using CEA for internal decision making will inherently know their audience, usually the leadership at whatever level the decision is made. For a department comparing alternative approaches to increasing enrollment in STEM courses, it could be the department chair or responsible faculty member. If a college is considering alternative advising interventions designed to increase student persistence, the decision maker might be a vice president. In other situations, the decision maker might be the president or the board of trustees.

In summary, challenges for community colleges in establishing a framework include defining the student success problem, setting specific goals for improvement, and identifying and considering alternative solutions through a clearly defined process. Once a framework is established, the next step is calculating costs.

Calculating costs. The cost of an intervention is the total cost of all resources required to implement and deliver the intervention. This total cost is calculated using the ingredients method, summarized in Chapter Two and detailed in *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017). Colleges actually have an advantage over contracted external researchers in determining the cost of an intervention. Researcher #1 observed "…they know so much about their institution, which outsiders really don't know, so for [colleges] it is a lot easier." External researchers must learn about the intervention and gather data on ingredients from the personnel involved, often requiring extensive interviewing. Depending on the audience,

they may also need to estimate national prices. Researcher #3 estimated that a recent CEA study required 160 to 180 hours to gather ingredients and estimate costs as an external researcher.

Colleges, on the other hand, are already familiar with their interventions. They know what ingredients are required and have easy access to personnel and accounting records. Furthermore, for internal decision making, colleges can use actual expenditure data for salaries, fringe benefits, equipment, facilities, and other ingredients - they do not need to estimate national prices, reducing the time required to calculate costs. For a relatively simple intervention, it might take only a few days to a few weeks to calculate the total cost.

In addition, for internal decision making, colleges do not need to be as precise in their cost calculations. A rigorous external study following a large intervention over multiple years, and using national prices for external validity, would require the researcher to consider inflation and discounting. In contrast, colleges following an intervention over a few years for an intended audience of internal leadership, could estimate local prices, use actual salary data, and omit considerations of inflation and discounting. This simplifies the calculation of total costs.

Another potential challenge lies in the design of the intervention. College personnel must consider if the intervention is replacing a program, or if it is an add-on to services students are already receiving. Administrator #2 observed that it is easier to determine costs for an add-on:

> You know if you hire a new advisor, that's clearly a new added cost, but if we're making use of things that are already on campus and just allocating them to the program in a different way, thinking about where to put that cost is, I think, a little bit challenging.

They continued that incorporating responsibility for the cost could also be challenging - was the resource provided by the taxpayer, the college, or a partner organization? Whether or not cost responsibilities are assigned to stakeholders will depend on the cost analysis framework a college chooses.

Determining the portion of a facility, or the percent of a faculty member or advisor's workload, devoted to the intervention can also be difficult, especially for personnel new to CEA. Researcher #3 reported that faculty and staff self-reported estimates of time spent on an intervention can vary widely.

Traditional accounting records are another challenge - they report total program costs rather than individual ingredient prices. Administrator #1 described their situation in trying to determine program costs with the college's current financial data:

> Can we get down to the detail on the cost side? I think that tends to be the issue. What kinds of data can we link it to on the financial side because the structures are different….There has been some effort to try to align the two, like…here's this academic program and here's the budget and the expenditures…and can we make some relationships here? We've really only talked about it, I don't think that we really have gotten very far with it.

Historically, college financial reports aggregate costs, making it difficult to link program ingredients to individual prices.

Finally, some colleges are opposed to calculating costs. They often know how much they spend per student to deliver undergraduate education, but seldom know how

much they spend per graduate. There may be resistance in the college community to gathering cost data for use in calculating such metrics. Administrator #4 described this resistance:

> We don't do that [measure cost per graduate or cost per outcome] commonly. It's one of the things that I think higher education has shied away from because, you know, thinking like a business is "bad", customer service is "bad"…it's not taken well by people.

In summary, challenges for community colleges in calculating costs include lack of expertise, lack of experience, a traditional financial accounting approach that aggregates costs rather than linking ingredients to prices, and resistance to gathering cost data.

Measuring effects. CEA depends on the accurate measurement of both costs and effects. Economists contracted to do a CEA study usually focus on the cost side of CEA, leaving the measurement of effects to social scientists and assuming the effectiveness measures they are given to work with are accurate. Colleges implementing CEA on their own will be responsible for calculating their own costs and measuring their own effects. While calculating costs can be a complex undertaking, templates are available to guide the process. There are no templates for measuring effects, and most community college IR offices lack the personnel, expertise, and time to do rigorous effectiveness testing. As a result, measuring effects is the more difficult task of CEA for most community colleges. Researcher #1 observed that "getting cost data isn't the real problem for colleges, they have access to the cost data, the real problem is the effectiveness data." Potential challenges in measuring effects include IR capacity, effectiveness metrics, planning for evaluation, experimental design, and data analysis.

Institutional research (IR) capacity. Much of the work underlying CEA will be done by IR offices, or their equivalent. IR capacity is a challenge for many community colleges, especially smaller colleges who depend on one or a few staff members to meet all data reporting needs. Administrator #2 acknowledged that "community college [IR offices] are very under-resourced," explaining that many are under-staffed and IR personnel often lack the expertise to do rigorous effectiveness testing and data interpretation. Offices that have the expertise may lack the time. Rigorous effectiveness testing can require six months or longer.

The IR office at one large Midwest college had an adequate number of staff, but with backgrounds primarily in technology and programming rather than statistics. Alternatively, the IR office at another college had staff with statistical expertise, but was time limited:

> We handle all federal and state reporting, and institutional reports like our board reports, student success reports, Achieving the Dream reports, and all our major big reports. We work with operational data, so if you need data to make a decision, to help inform a decision, for a presentation, for a grant, to evaluate how something is doing, to modify something - we can get you that… we do a lot of ad hoc data requests…probably over 150 ad hoc data requests last year.

In response to an increased emphasis on data analytics and improving student success, many colleges are increasing their IR capacity; however, most are still under-resourced.

Effectiveness metrics. A significant challenge colleges face in measuring effects for CEA is linking an intervention's desired outcome to one specific success metric. Researcher #1 described what colleges need to have in place for CEA:

> They really have to have a pretty straightforward objective - cost, completion,

> persistence - whatever they want it to be, they need to have that, and they need to be able to defend it to themselves. That's not easy, getting people to focus on just one thing and one thing alone.

If an intervention has more than one anticipated outcome, colleges may choose to use a more complex cost analysis technique - cost-utility analysis. It is unlikely, however, that colleges will have the expertise to do cost-utility analysis without first learning to use CEA. Using CEA will require that they select one primary outcome and measure one effectiveness metric for CER calculations. The following challenges involving effectiveness measures emerged during interviews:

- failure to select a metric,
- clarity and timing,
- lack of consensus, and
- multiple definitions.

Failure to select a metric. In some cases, colleges - especially those new to student success efforts - never define an effectiveness measure for their programs. They track student success metrics in general, but do not link them to particular programs. As long as student success is improving the college may maintain their current programs and even initiate new programs, while assuming the programs are successful. Advisor #2 observed that many colleges never examine their effectiveness data: "They might know in a very general way what their retention is, but they haven't attached it to specific programs. I would say that's kind of our frontier."

Clarity and timing. Sometimes a desired outcome was vaguely acknowledged, but not precisely defined. For example, a college might implement a new student success

course because a similar course was successful at a peer institution or was recommended by a national organization as a best practice, but fail to define a success metric or establish an evaluation plan beforehand. Many of the colleges interviewed did not define desired outcomes or establish success metrics prior to implementing an intervention. Some started thinking about evaluation after the intervention was in place, and in some cases, interventions were not evaluated at all.

One vice president described their identification of success metrics prior to implementation as "hit and miss". Another college leader commented that "we talk about it, but they feel a little…a little lukewarm…so they need to be probably harder outcomes." Another, when asked if they establish success metrics before implementing a new program, responded:

> Historically, not really. Evaluation is still a big one that I don't think is handled the best, even nationally, anywhere really. And everybody wants to do it, and we do do it…but it's typically after the fact, and it's not up front.

While the majority of colleges interviewed did not consistently establish evaluation plans with defined success metrics prior to implementation of an intervention, many were actively considering or developing such processes.

Lack of consensus. An additional challenge in defining effectiveness measures is reaching consensus on an appropriate metric. Administration and faculty may not agree on a metric for a particular program or intervention. Educational researchers interviewed noted, for example, that administration may want to measure persistence, while faculty may feel grades or a well-rounded student are better indicators of success.

Multiple definitions. Terminology may also be a problem, especially with external data requests from state or federal agencies. Differences in terminology make comparisons between colleges or programs inaccurate and misleading, reducing the usefulness of effectiveness measures. An IR office administrator noted that "there are so many people asking for things, and they ask for it slightly differently, so the definition changes…we're still working to get a more standard definition." They further observed:

> We don't always use the same thing because it depends on what the report is. That's a big issue. Nobody can tell the same story. You would think that 'Oh, can I have a persistence rate' and everybody understands - NOPE. Especially persistence and retention. Some people use them interchangeably, some people slightly change the definition. It winds up not being apples to apples. It's a whole different statistic.

Experimental design. Experimental design is also a challenge for community colleges. Ideally CEA utilizes random control trials, an experimental design where program participants are randomly assigned with an equal chance of receiving, or not receiving, the treatment. However, as Researcher #1 noted, community colleges "don't have a good social science testing protocol…they can't randomly assign students." Community colleges usually avoid random assignment to an intervention because of their equity mission. In place of random assignment, they use quasi-experimental designs such as interrupted time series or comparing students who participated in a treatment with those who did not in the same semester.

Quasi-experimental designs can be effective, but are subject to bias. Statistical methods such as propensity score matching can help address - but not remove - all bias. Researcher #2 commented:

> Multiple regression and/or propensity score matching can help control for observable differences in groups….The trouble is that it doesn't control for un-observables, like motivation, that can bias estimates quite a bit. Interrupted time series or difference-in-difference models can eliminate some sources of bias and are relatively easy to estimate. However, for truly unbiased estimates they'll need to use either regression discontinuity designs or a random controlled trial, which is often not feasible.

For colleges whose IR staff have the expertise to use advanced statistical methods to strengthen quasi-experimental studies, the challenge is time. One vice president over IR commented:

> We don't have the time. We have the expertise; our staff has the statistical backgrounds to run statistical analyses, but it's going to take a little while. And typically we don't have that type of little while to sit down and work on a research project because we're constantly being asked to do other things….In the past we might have done it for one thing, two things, here and there, [but] it's probably going to take all semester or all year to get that analysis done. It's time consuming.

Data analysis. CEA depends on the precise measurement of intervention effects. As such, use of rigorous statistical analysis is optimal. However, most colleges lack the capability and/or the time to use advanced statistical methods. Others are inexperienced in linking data to an intervention. Additionally, the databases from which IR staff draw their data may be cumbersome.

Currently, colleges often report effectiveness using descriptive statistics. When asked how often they determine statistical significance in reporting results, Administrator #4 responded:

> The majority has been comparative. Every now and then, if we had the time, we could do a chi-squared distribution, a T-test, a simple regression, a multiple regression. We've done it, we just haven't done it consistently, and we haven't always done it. The majority of the time it would be more of a comparative, descriptive story - has our course success rate increased, has our GPA increased,

has persistence increased, has the graduation rate increased?

When asked if their community college IR office used propensity score matching or regression to address the absence of random assignment, Administrator #1 replied "no, nothing that fancy". Some large colleges regularly use advanced statistical methods, including The City University of New York, a multi-institutional system that includes seven community colleges (https://www2.cuny.edu/wp-content/uploads/sites/4/media-assets/APPAM_poster_final.pdf). However, most colleges lack this capacity.

Some colleges are just beginning to measure effectiveness and lack experience in linking data to an intervention. Advisor #2 observed that colleges just beginning to measure effectiveness will need to grow more comfortable with data analysis before they consider CEA; "newer schools are just…they're so floored with just getting a handle on disaggregated data [and] attaching it to an intervention."

Another challenge colleges face is the quality of their databases. Colleges may have been building their databases for decades, sometimes since the 1970s. Technology has evolved, but data may be continually layered on top of old formats, or side by side with old formats. In addition, staff may be afraid to delete data in case it is relevant even when it appears to be extraneous, such as placeholder or test data.

The contributions of different personnel over the years is also a challenge. A succession of IR and institutional technology staff may choose to design data tables differently and create different tables for similar purposes, leading to an abundance of cumbersome tables not easily simplified. For small IR offices with only a few staff, and larger offices whose staff must pull their own data, this creates time challenges as well.

Another issue is updating technology. An IR administrator at a large college described one issue:

> It's been many, many years and we've done patches along the way to get things to work. One hundred patches later, we don't have what's out of the box, and when there's an update, we can't just automatically do the update because it's no longer out of the box…it makes things difficult.

They went on to observe that higher education is at a tipping point:

> Higher education is at a point where we're really, really close to doing a lot of really great things, but because we were so far behind - you know, the health care industry did this ten plus years ago, the business world did this twenty plus years ago - we're still in the nascent stage of big data and data analytics and getting the right technology.

Furthermore, newer technology may use one language, while an existing database uses an older language, making communication between the two difficult.

In summary, the potential challenges colleges face in measuring effects include under-resourced IR offices, defining an effectiveness metric, experimental design limitations, and limitations in using advanced statistical methods for data analysis. Once a college has data on intervention costs and effects, the next step is combining cost data and effectiveness data to produce the CER.

Calculating the cost-effectiveness ratio. The CER is produced when costs are divided by effects. It is used to rank alternative interventions by their cost-effectiveness, allowing a decision maker to discern which program provides the greatest impact for the lowest cost. Challenges in calculating CER include ensuring that (a) both costs and effects are expressed in the same unit (e.g. cost per student and effect per student), and

(b) the ingredients used to calculate total costs are directly responsible for an intervention's effects.

In addition, sensitivity testing should be used to estimate how uncertainty in costs or effects might impact the CER. College personnel doing CEA might not be familiar with sensitivity testing. While it can be a complex undertaking, simplified approaches are available and appropriate for colleges. Once a CER is calculated, colleges will need to be careful in how it is interpreted and framed for decision making.

Interpreting Results. Interpreting results can be difficult for any beginning researcher, and community colleges are no exception. Researcher #1, referring to this final stage of the analysis, noted "that's really where they [will] struggle…they will struggle to interpret it." Researcher #1 continued, using the example of a teacher's aide:

> We're going to get a teacher's aide, and we're going to say to ourselves "Okay, this is roughly going to cost us $5000 per course per semester….What are we going to get out of that? If we get two more persisters, we've got a sense. [But] what is a persister worth to us?" That is a little bit of a harder problem for [community colleges]. That's why we start off with "pick your outcomes that are helpful to you and meaningful to you". If it was $5000 to hire and train this person…and we got two more people back in the college then we expected, everybody will ask what does that mean? Is that good or bad?

Colleges that fail to clearly define outcomes goals will have a particularly difficult time interpreting the results of CEA.

Colleges may need to establish a context for interpretation. Establishing context can require more than one study. Researcher #1 explained:

> A new innovation costs $5000 and produces two additional persisters. You know that is better than getting one persister, and know it's better than spending $10,000 for two persisters, but beyond that, what do you know? You may not know, with only one study, if that is good or bad. As you continue doing studies

> you establish a context that helps in interpretation. It can become an approach that a college uses to evaluate interventions. As an approach, they will develop a context in which to interpret the results more effectively.

For small comparative interventions, CEA results may be relatively easy to interpret. In other situations, a college may need to gain experience, be invested in the process, and be willing to use CEA consistently to establish context.

Using CEA in decision making. CEA can be resource intensive, but is justified when costly or high-impact decisions are informed by the results. While CEA should never be the sole factor in a decision, it is uniquely designed to highlight how resource allocation decisions will impact students. However, the results of CEA can suggest choices a college may not be willing to make. A study is risk free when it validates a new program, as opposed to data that indicate one program is more cost-effective than another and therefore suggest a decision. CEA is inherently comparative - it evaluates two or more programs, demonstrating which program provides the greatest value to students and to the college. Barring extenuating political or social factors, CEA suggests the less cost-effective program should be eliminated.

Eliminating a program can be challenging. When the process of CEA was explained to one administrator, they quickly asked "What happens if you have to get rid of an entire program?" As Researcher #1 explained "the trouble with cost-effectiveness analysis is that there's a ranking. Somebody has to come first. Somebody has to come last. And the person who comes last complains much more than the person who comes first." Administrator #4 similarly observed "Once you've learned what's working and

what's not working, that means that something may go away, and you have to be okay with that."

CEA can also be used ex ante to evaluate two alternatives not yet implemented to estimate which will be more cost-effective. In this case, rather than eliminating a less cost-effective program, a college is choosing to add a more cost-effective program. This approach can also be helpful when considering whether or not to scale a program.

General challenges. In addition to the practical difficulties presented, colleges face challenges in awareness, implementation, and campus culture.

Awareness. Most community college leaders are unaware of CEA, and the potential benefits it offers to improving student success and decision making. Among the 26 college leaders interviewed for this study, only three had heard of CEA, and only one was aware of the value it added to decision making.

Implementation. Implementation challenges include (a) distractions, (b) collaborations, and (c) applications.

Distractions. College presidents face tremendous pressure to do more with less. Increased accountability expectations and decreased funding create intense demands on college leadership. Consideration of CEA may be relevant and valuable, but less urgent - especially if data on cost-effectiveness is not requested by a board or legislature while numerous other reports are. Researcher #1 observed, "Everybody is busy fighting fires."

Collaborations. CEA requires collaboration among different campus offices, depending on the size and complexity of the college organization. Some campuses

struggle with *silos* - departments that don't coordinate their efforts. One college leader described:

> [We need to] sit down and recognize "Okay, you play this role, and I play this role, how do we put all this together so that we're being more effective and efficient versus functioning in silos." Silos are deadly because of the mission that we have…that's a major barrier.

Administrator #3 noted what CEA would require at their college, "…it's going to have to be a blended conversation between finance, student services, and academics. And that kind of report is not going to be easily crafted."

Applications. The application of CEA must be appropriate to the intervention. CEA is comparative, and colleges should begin by using it to compare small, discrete interventions. Many colleges that joined the student success movement early in the 21st century have utilized discrete interventions in the past, and are now working toward holistic approaches such as guided pathways and redesign (Jenkins, Lahr, Brown, & Mazzariello, 2019). Advisor #1 described their direction, observing that "…most of [these] colleges are really engaged in redesigning the student experience…it's less about individual initiatives….There are initiatives as a part of that, but it's less about that and more about the redesign." Researcher #4 also acknowledged the growing trend toward redesign: "…certainly it's important to look at discrete interventions, but in general [improving student success] is going to take alignment and redesign of lots of different things." In redesign, it is difficult to separate the effectiveness of individual components from holistic, wrap around student services. CEA can be applied, and was successfully used to demonstrate the cost-effectiveness of The City University of New York's

Accelerated Study in Associate Programs (ASAP), however it is too complex an undertaking for colleges new to cost analysis.

Culture. Cultural challenges include (a) attitudes, (b) resistance, and (c) ethical concerns.

Attitudes. College leaders may believe their economic situation is fixed without sufficient flexibility to consider CEA, or that there are no more efficiencies to be found. As Researcher #4 observed, community colleges are "incredibly financially efficient" but "educationally extremely inefficient", reflecting the low cost per student consistently evident in community college spending over the last decades. However, low costs per student have been accompanied by low completion rates, suggesting that how resources are allocated - a process informed by CEA - is critical and timely.

In addition, colleges have traditionally paid attention to effects while ignoring costs. Administrator #3 described that costs are not a priority "as long as the money is there to do it, and there's an effect." In addition, Advisor #2 observed that colleges are not in the "habit" of knowing what things cost:

> …a lot of times the people making the decisions don't understand the hidden costs - if you don't do it a certain way the price you're going to pay - you know, what things actually cost. They don't map out the steps needed to operationalize a concept, and therefore don't adequately anticipate, or recognize, the actual costs they will face.

Furthermore, Researcher #4 commented that most colleges are not thinking strategically in the area of finance. The interviews conducted for Part 2 of this study corroborated this situation; only a few colleges were considering costs outside the context of cost-feasibility.

Resistance. Another challenge to using CEA on campus is faculty and administrator resistance. Members of the campus community may perceive CEA to be a business-like approach inappropriate for *democracy's college*. When asked about campus discussions on using cost data more strategically, Administrator #4 responded:

> People are going to struggle with it, and are struggling, to accept that that's where we're going. And it's not saying that we're working like a business, or we're leading like a business, but at the same time we have to be as efficient with our resources [as we can]. The bottom line is improving student success. If that's the ultimate goal, we have to do it with that as the ultimate goal. So the outcome isn't making more money, the outcome is to improve students graduating and getting into the workforce.

Faculty are often passionate about their courses and programs, and may be reluctant to accept evidence that indicates their courses or programs are not cost-effective. A faculty member involved in planning their college's intervention evaluation process described how student success committee members responded when asked if initiatives found to have little or no effect should be eliminated: "No, why would we do that, everything is just fine, everything's working."

CEA represents a new way for colleges to consider costs. Advisor #2, reflecting on the challenge of change, commented that it will require a college-wide perspective. Advisor #1 added "…change is hard, and it takes a long time to really institutionalize it." Such changes in campus culture are facilitated by college leadership. Regarding the importance of leadership, one college leader stated that "…we need presidents who are relevant and who are adaptive and who are creative and who are willing to break down those old paradigms of academia."

Ethical concerns. Ethical concerns are another challenge. Community colleges prioritize their social justice mission. Administrator #3 expressed this perspective:

> If you're trying to move students who have deep remedial needs, you're already talking about…the hardest population to move. So, the question is "is statistical analysis acceptable?" If the [results of an intervention] are not statistically valid or reliable or meaningful, but 500 students were impacted, how does that factor into the discussion? That has to have some meaning in the equation, especially if …the students that you're trying to help are the tip of the spear when it comes to the mission of a community college….if you can show some benefit, even though it's not statistically significant…this is probably the reason that these kinds of calculations [cost-effectiveness] are not readily done.

Furthermore, Administrator #3 advised that the challenge of costs should never dominate conversations about student success.

Challenges exist for community colleges in implementing each stage of CEA. The next section will recommend possible solutions to these challenges.

Research Question Three

Research question three: How can these challenges be addressed?

When CEA is used for internal decision making, the process can be simplified and adapted for community colleges. The findings for research questions three are presented as they relate to (a) the stages of CEA, (b) using CEA in decision making, and (c) general challenges.

The stages of CEA. As mentioned previously, the stages of CEA are

1. establishing a framework;
2. calculating intervention costs;
3. measuring intervention effects;
4. calculating the cost-effectiveness ratio; and

5. interpreting results.

Establishing a framework. To establish a framework, colleges can begin by identifying their theory of change:

- What student success problem needs to be addressed?
- What is the outcome goal?
- What alternatives have been identified to address the problem and accomplish the goal?

In addition, they can develop a process for selecting interventions that assesses implementation feasibility in resources, equity needs, campus climate, and political considerations. Many colleges interviewed were already working toward a defined process for proposing and selecting student success interventions.

Calculating intervention costs. Calculating costs can be simplified for internal decision making. Researcher #1 advised that calculating costs can be "low-tech….not hugely involved with spreadsheets with lots of pieces of information." A template that categorizes costs such as personnel, facilities, and supplies, can be used to record resources and prices. A sample template is provided in Appendix A: Sample Cost Template. A column for notes and assumptions is included; colleges should acknowledge all assumptions and sources of uncertainty as they gather cost information. Researcher #3 described the uncertainty that can accompany cost calculations, "I knew we would have to make a lot of assumptions, and document why we were making assumptions."

In some cases, a college may want to calculate resource costs supplied by external stakeholders. For example, they may wish to anticipate the cost to continue a grant-

funded program after the grant ends. A template for recording costs across stakeholders is provided in Appendix B: Sample Cost Template Across Stakeholders.

College financial reports may not link intervention ingredients to prices. However, Researcher #1 explained that this should not be a problem for most colleges, because they are familiar with an intervention, and can go directly to the people involved for information on ingredients and prices. Actual salaries and fringe benefit data for intervention personnel can be obtained from college financial records. All ingredients and costs should be recorded on the template. Ideally, CEA is planned along with an intervention, and done concurrently with the intervention for the most accurate calculation of costs. In such cases, personnel involved should keep a time log to estimate the portion of their workload devoted to the intervention.

For long-term interventions requiring consideration of inflation and discounting, or studies requiring external validity, colleges should refer to the CBCSE CostOut tool. CostOut was developed by the CBCSE and is available on their website at https://www.cbcsecosttoolkit.org. The tool helps colleges match ingredients to national prices, and adjust prices for discounting, inflation, and annualization. It also aids the organization of cost data and calculations, and can calculate the CER from data entered by the researcher.

Measuring intervention effects. Challenges in measuring effects include IR capacity, effectiveness metrics, planning for evaluation, experimental design, and data analysis.

IR capacity. As described, most college IR staff lack the expertise or the time to do rigorous statistical analysis. However, rigorous statistical analysis is not required for internal decision making. Colleges can adapt CEA for internal use by using descriptive statistics, as discussed in the section on data analysis. It is unlikely that colleges will have the resources to expand IR office capacity in the short term. However, in light of growing accountability pressures and increased reporting demands, many are considering how to expand IR capacity. Such considerations can include adding staff with expertise in statistical methods.

Responsibility for CEA need not be assigned solely to the IR office. The IR office will usually contribute the effectiveness data; however faculty, staff, or administrators can partner with the IR office by collecting cost data, determining total intervention costs, calculating CERs, and interpreting CERs for decisionmakers. Faculty with expertise in economics may be particularly helpful. Colleges interested in CEA should use *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017) as a guide, although additional training may be needed and is not yet regularly available. When individual colleges do not have the resources or personnel needed for CEA, college districts and state higher education systems can form a CEA team to learn the methodology and provide support to individual colleges.

Effectiveness metrics and planning for evaluation. CEA relies on accurate measures of effectiveness, requiring that colleges plan for evaluation and select a single effectiveness metric to represent the outcome of an intervention. Colleges can work to establish an evaluation and assessment environment that identifies success metrics prior

to implementing an intervention. One college included in Part Two had over a decade of experience in student success efforts, and had developed a clearly defined process, as described by their vice president:

> We start with the end in mind, where is it you want to be, by when….We know what the metrics are for the programs. Frankly, that's the first question when something comes forward, "where are the metrics, how are we going to evaluate if this is going to be effective or not?" If it's not in there, it gets sent back….So, when it gets to [senior leadership] we know how much it costs, we know the projected timelines, we know who the audience is, we know what the outcomes are supposed to be, we know what the assessment metrics are going to be. It's all in the proposals.

Experimental design. In the absence of true experimental design, colleges are already using quasi-experimental design. For example, a college might want to compare a 2014 student cohort who did not receive a treatment to a 2015 cohort that did receive a treatment. This is an acceptable substitute, with the cautions noted below. When asked about the limitation colleges face in using random control trials, Researcher #3 noted that the use of comparison data over consecutive years is:

> …a pretty strong design if they don't have any real reason to think that students in 2014 were substantially different than students in 2015….And the time is so close, so unless there was a major event at the college or in the community…a recession or something that changed the types of students going to the school that year…that's a pretty strong comparison…it's an interrupted time series design, and that's considered a quasi-experimental design….I think that's a legitimate way to do CEA.

Researcher #1 also reported that colleges could appropriately "compare ourselves to ourselves over time," cautioning that "it needs to be something pretty narrow that changed between one group of students and the next." When colleges report results based on quasi-experimental designs, it is important that they acknowledge any sources of

potential bias and include mention of any conditions that could affect the characteristics of students being compared in their results.

Data analysis. A significant challenge for colleges is the use of advanced statistical methods. However, descriptive statistics are adequate for internal use. One community college IR administrator observed:

> I don't know if it would make a huge difference in the big scheme of things, especially for the non-data world. If it's statistically significant, if you just did regular descriptive statistics and ran Fall to Spring persistence, you're going to see a difference. If it wasn't statistically significant you wouldn't see a difference. It [statistical significance] just brings a harder value to it, especially to the academic side.

Researcher #4 expressed a similar perspective, while cautioning that colleges must be careful in their comparisons. Referring to community college data analysis, he commented:

> They're likely to look at descriptive outcomes. But they need to ask themselves, are these effects that we're seeing the result of change in student composition, or some factors independent of the practice? Or do we think that any improvement we're seeing is really the result of the practice, without having to do multivariate analysis, which…most college cannot do.

A 2010 study of the Community College of Baltimore County's (CCBC) Accelerated Learning Program (ALP) demonstrated the adequacy of descriptive statistics (Jenkins et al., 2010). The college first evaluated ALP - a co-requisite delivery model that mainstreamed developmental students into college level English courses - on their own using descriptive statistics. Their results indicated that ALP was both effective in increasing completion of college level English courses and cost-effective. Before expanding the program, they asked the CCRC to do a rigorous, quantitative study.

The CCRC study measured descriptive statistics, and also used multivariate analysis and seven regression models. Their descriptive statistics, while slightly different from the CCBC results, showed the same trends as the original CCBC analysis. Furthermore, while the CCRC numerical values were slightly different in magnitude, the trends revealed in their descriptive statistics and multivariate analyses were the same. Colleges can use descriptive statistics to measure intervention effects for CEA calculations.

Calculating the cost-effectiveness ratio. The CER expresses the relationship between costs and effects. It is the final calculation of CEA, and the metric used for decision making. For the CER to be meaningful, colleges should ensure (a) that a theory of change underlies the selection of an intervention and an effectiveness metric, and (b) costs and effects are calculated in the same unit (e.g. per student). They should also use sensitivity testing to help interpret the CER. For a detailed description of sensitivity testing, colleges are referred to *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017). However, for internal decision making, a simplified version is adequate. A simplified version estimates increments of higher costs and increments of lower effects. When a CER calculated with higher costs and lower effects still indicates a program is cost-effective, there is less concern about the precision of the original calculations.

Interpreting results. Interpreting results may be difficult for colleges new to CEA. However, interpretation will be easiest when colleges begin with small, discrete alternatives. Researcher #1 explained how this might work in comparing three alternative

course delivery methods - face-to-face, online, and hybrid - with persistence as the success metric:

> How many students who took [each format] came back? Let's say it's face-to-face 50%, hybrid 20%, …and online 40%. I can translate those into actual students, so if I have 100 face-to-face students I know I've got 50 back, if I have ten hybrid, I know I've only got two back, etc…. I can translate those into …yields, the actual number of students back. It's the yields I want to work with….then you should be able to cost [each delivery format] out. Face-to-face - what does it cost? Hybrid - what does it cost? Online - what does it cost?...You're trying to estimate the costs and you're a little uncertain as to what the costs are and you're not really sure how to do it….you're going to put the [approximate costs and the yields] together as just a ratio. So if you've got five thousand dollars and two…students - that's $2500 [per returning student].

For each delivery format, the cost would then be divided by the yield (the effect) to produce the CER. The CER can be used to compare and rank the alternative delivery formats for student persistence. If cost calculations are a little off, CEA will still work as long as the effectiveness measure is accurate:

> They don't have to be precise numbers….if the numbers are all 10% below where they're supposed to be, that doesn't matter because the thing you're really doing is ranking them. You're saying face-to-face…is expensive, but the persistence rate is…higher than hybrid. And…online is expensive and the persistence rate is pretty low. So that's our obvious weak one. All you really want to do is rank these…and it doesn't matter if [online] is a close second or a distant second, [it's] going to be second.

They went on to explain how this can work for a college new to CEA, and the flexibility available to colleges in calculating costs and interpreting the resultant CER:

> To put it in context, if face-to-face persistence rates are 50% and hybrid persistence rates are 25%, face-to-face can be twice as expensive as hybrid and the two things are going to be equivalent. If face-to-face is four times as expensive, it's not worth it. If it costs the same, obviously it's really worth it to do face-to-face….that's the only logic we want at the end. We don't really need the number. We just need to know, look, it's more expensive and it's no better, or it costs about the same and it's better.

Another way to interpret results is to consider, based on effects, what costs need to be for one alternative to be more cost-effective than another:

> Another way to think about it is if you're really not sure about doing the costs, try to get a really good idea of the effectiveness, because that's going to tell you what your costs have to be. If one mode is twice as [effective] as the other, it only has to be twice as expensive. If it's the same cost, it's a win win….We're just coming up with a logic framework. If it's not very good, it better be cheap. If it's good…it can be expensive.

Using CEA in decision making. As mentioned previously, CEA is only useful if it has the potential to impact a decision. Colleges that frame intervention efforts with a theory of change will define decisions within the same framework. Colleges also need to decide if they are interested in making the potentially unpopular decisions that may be suggested by CEA results (e.g. program termination). College leadership can promote a safe environment for decision making by ensuring support, such as reassignment, if faculty and staff are affected.

General Challenges. Additional barriers to the use of CEA in community colleges include (a) lack of awareness, (b) implementation issues, and (c) campus culture.

Awareness. Lack of awareness is a major challenge to the use of CEA. The majority of the college leaders interviewed for this study were unaware of CEA, but expressed interest in learning more. Their comments are presented in Chapter Five. Awareness is not a challenge colleges can address; action must come from grant-making agencies, national organizations, and legislatures in a position to recommend or request cost analysis. It was outside the scope of this study to explore awareness of CEA among these stakeholders, however, additional training in CEA methodology for community

colleges would increase awareness and provide resources to colleges wishing to incorporate CEA in their decision making.

Implementation. Using CEA to evaluate complex student success programs, such as guided pathways and holistic wrap-around services, is very expensive - prohibitively expensive for most community colleges. In consideration of such resource requirements Researcher #1 recommended that, when used by community colleges, "cost-effectiveness is really for small changes, pretty small changes" because analyzing a whole college redesign - such as pathways reforms or The City University of New York's ASAP - can take several years and cost "hundreds of thousands of dollars." In contrast, for small discrete interventions or individual pieces of a pathway reform, with effectiveness results already available, colleges can potentially complete their own study with one or two personnel in 4-8 weeks. As experience is gained in doing CEA, or if CEA data is gathered concurrently with an intervention, the time required will decrease. For colleges just beginning CEA, feasible projects might compare two course delivery methods for the same course, different pedagogical approaches, or alternative sections with and without supplemental instruction.

Colleges will also need to designate personnel who can devote a portion of their workload to learning and using CEA. This may be an IR staff member, a faculty member, or an administrator. It is unlikely that personnel will have training or expertise in CEA. The CBCSE offered trainings and workshops in cost analysis from 2015 to 2018. They may offer additional trainings in the future. Colleges can refer to the CBCSE website for information - https://www.cbcse.org/ies-methods-training. Detailed guidance on CEA

methodology is also available in *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017).

Culture. As colleges work to create cultures that support student success, they are creating cultures that also support CEA. One college leader described the culture at his institution:

> It's tough to make those changes…it takes the courageous to fight the fight to get those changes for the benefit of the students. And we must change to benefit the students and to put them first, always first, in everything that we do.

A culture that supports risk-taking is also important. Another college leader described supporting faculty in risk-taking and innovation as part of a "cultural shift around our student success agenda." Shifting campus culture and focusing all internal stakeholders on student success can be a long and challenging process.

Addressing historical attitudes that prioritize effects over costs is perhaps the most challenging culture shift. Without awareness of what CEA is and what it can do, college leaders may avoid considerations of cost as a way of emphasizing a focus on student success. Researcher #1 noted that in higher education "People are much more interested in 'does it work' than 'what is it going to cost', even though it could be very expensive for the colleges." Many colleges already allocate resources based on student success needs and strategic objectives; what they are not doing is using cost-effectiveness data to assess whether or not they are spending in the most *effective* way. Again, additional cost analysis trainings targeted to community colleges, as well as increased requests for cost data from grant-making agencies, will help increase awareness of the benefits of CEA.

Discussion

CEA is a feasible tool for community colleges to incorporate into resource allocation and student success decisions. As indicated by this research, the methodology used in expert studies can be simplified and adapted by individual colleges for use in internal decision making. Furthermore, the resources and competencies required for CEA are accessible to community colleges. While the adapted CEA methodology used by colleges will lack external validity, the results will establish a relationship between intervention costs and effects, allowing colleges to discern the impact of their spending.

CEA also adds value by encouraging a mindset of strategic financial decision making. Researcher #4 commented on the importance of cost-effectiveness and a financial mindset in times of resource constraints:

> …they're [community colleges] going to have to reallocate costs…they're going to reallocate resources rather than use new money, and so what they should be doing is trying to identify practices that benefit students at scale…and then think about cost-effectiveness…and where they should be reallocating their time and resources. I don't think they need to make as precise calculations of cost-effectiveness of particular interventions…but they should be thinking about cost-effectiveness.

In addition, the processes that facilitate CEA also facilitate intentional student success efforts - defining a problem, setting a goal, selecting an intervention, establishing an evaluation plan for the intervention, and acting on the results of the evaluation. CEA adds an additional component - costs - allowing colleges to link their spending to their outcomes. The potential benefits of CEA in improving student success, as demonstrated by published studies, outweigh the risks and challenges; CEA helps colleges allocate scarce resources in ways most beneficial to students.

Summary

Part One of this study explored the adaptation of CEA methodology for use by individual community colleges, including what is required for colleges to perform CEA, challenges that may exist to the use of CEA, and potential solutions to the challenges. The findings suggest that CEA methodology, as described in *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017) can be adapted and successfully used by community colleges for internal decision making.

Appendix C: CEA Adapted Checklist provides a checklist colleges can use to plan and assess a cost analysis study as they progress through the stages of CEA. The checklist is adapted from the "Checklist for Evaluating Economic Evaluations" found in *Economic Evaluations in Education: Cost-Effectiveness and Benefit-Cost Studies* (Levin et al., 2017, pp. 270-272). Both the original and the adapted versions are included for comparison.

This chapter presented the findings for Part One. The next chapter presents the findings for Part Two, an exploration of how community college leaders work to increase student success, and how CEA fits into their efforts.

Chapter Five: Findings - Part Two

This chapter presents the findings for Part Two, a grounded theory study initially designed to explore efficiency in community college student success programs. Interviews were requested with college leaders - Chancellors, Vice Chancellors, Presidents, and Vice Presidents - at institutions currently or previously active in national student success networks. Interviews were unstructured for research questions one and two, and semi-structured for research question three. Interviews lasted from 20 to 90 minutes, were conducted in person and by phone, and were recorded and transcribed. Coding was done by hand and with MAXQDA software. Twenty-six leaders from 14 colleges in six states participated in the study.

This chapter is organized in four sections: overview, findings for research questions one and two, findings for research question three, and chapter summary.

Overview

Purpose of the Study

Part Two was a grounded theory study initially exploring how community college leaders use student success program cost data in decision-making. The focus of a grounded theory study often evolves and changes as interview data are collected and analyzed (Glaser, 1978). As described in relation to the research questions below, this study evolved and changed in response to the data. Part Two also sought to understand how college leaders perceive cost-effectiveness analysis (CEA) and its potential use at their institution.

Research Questions

The original research questions for this study were:

1. How do community college leaders perceive - and if applicable, assess - the link between institutional spending and student success?

2. How do community college leaders perceive and pursue efficiency and effectiveness in student success programs?

3. How do community college leaders perceive cost-effectiveness analysis and its potential role in promoting efficiency and effectiveness in student success programs at their institution?

Early in the study, however, data analysis revealed that research questions one and two were partially irrelevant: (a) participants did *not* consider links between institutional spending and student success, and (b) while effectiveness was a priority in student success programs, efficiency was seldom discussed or pursued. College leaders expressed little interest in the costs of an initiative, other than cost feasibility. As such, the data revealed priorities for community college leaders that were different than anticipated. Research question three *was* relevant; most leaders anticipated future demands for increased financial accountability from external stakeholders - accountability that can be demonstrated with CEA. As a result, while only three participants were aware of CEA prior to the interview, all expressed interest in CEA after the interview.

Findings and Discussion for Research Questions One and Two

The findings for research questions one and two are presented as (a) restatement of the questions, (b) the application of grounded theory, (c) introduction to the theory, (d) findings, (e) discussion, and (f) summary.

Restatement of the Questions

1. How do community college leaders perceive - and if applicable, assess - the link between institutional spending and student success?
2. How do community college leaders perceive and pursue efficiency and effectiveness in student success programs?

As mentioned previously, the focus of the study shifted as data revealed that efficiency in student success programs was not a priority for community college leaders. The priority that did emerge was increasing student success. As such, questions one and two were replaced with a new question: How do community college leaders work to increase student success?

The Application of Grounded Theory

Grounded theory methodology is so named because it proposes a theory that is grounded in, and emerges from, the data. For this study the data source was interviews, and the participants were community college leaders. A grounded theory identifies the *main concern* of study participants. As Holton and Walsh (2017) described, the main concern "highlights the issue or problem that occupies much of the action and attention" (p. 88) of participants. The main concern that emerged in this study was Increasing Student Success. Grounded theory also identifies a *core category*. The core category

explains how participants work to manage or resolve their main concern; it is identified as it recurs throughout the data with centrality, frequency, relevance, grab, and variability (Holton & Walsh, 2017). The core category that emerged was Seeking Alignment.

As theoretical coding and analysis continue, a theory emerges that relates concepts and categories, revealing patterns of behavior used by participants to address their main concern (Glaser & Strauss, 1967). A formal theory is broadly generalizable to diverse areas, "abstract in terms of time, place, and people until it is applied" (Holton & Walsh, 2017, p. 21). In contrast, substantive theory is focused and specific to a particular area of interest. This study proposes a substantive theory specific to student success decision-making patterns among community college leaders. The data revealed that study participants worked to increase student success by seeking to align college culture, processes, and programs to a student success mission. The theory that emerged from the data was *Seeking Alignment: Managing Change to Increase Student Success*.

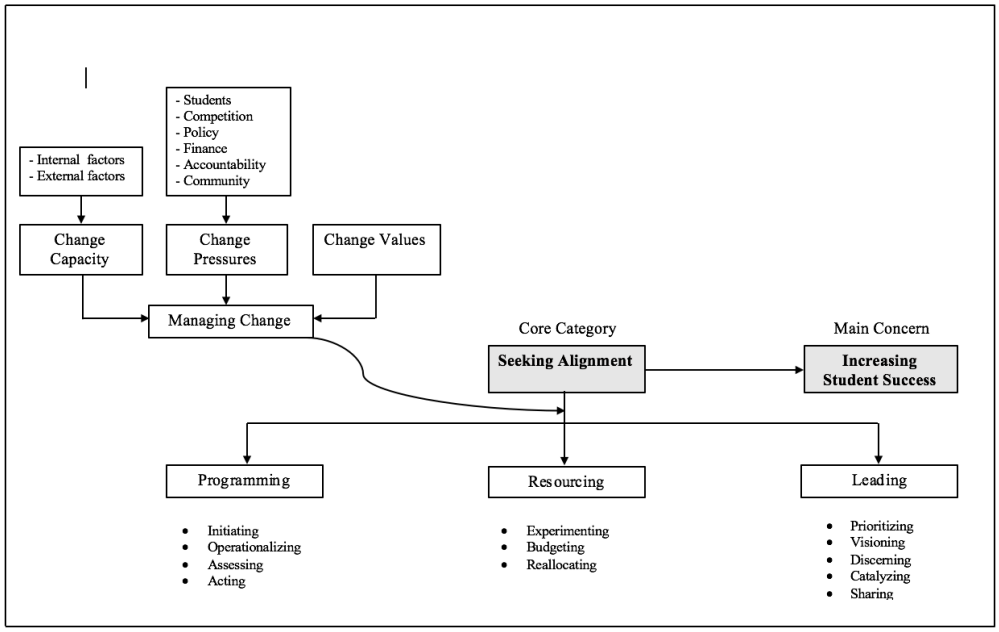
As mentioned earlier, it was anticipated that student success program costs would be a main concern for community college leaders. For most colleges, reduced funding and constrained resources are a constant reality. As one leader observed "You're never going to get more, and sometimes you get less…it's about innovation and creativity within the same limits of funding." Under such conditions it would be reasonable for financial pressures to significantly impact student success efforts, especially when 85% or more of a community college budget is often committed to fixed expenses. With few discretionary funds, decisions concerning expensive programs might be highly dependent on financial variables, even framed in a context of strategic finance. However, student

success program costs factored only minimally in decision making by college leaders. While aligning resources to student success was a priority, maximizing the effectiveness of college spending was not.

Introduction to the Theory

Seeking Alignment: Managing Change to Increase Student Success describes how community college leaders work to increase student success by aligning institutional efforts to a student success mission (Figure 5.1). Realignment of college priorities in

Figure 5.1. Seeking Alignment: Managing Change to Increase Student Success



response to environmental change has always been required of community colleges. However, the demands of the last two decades, including an evolving mission and shifting demographics, created a complex labyrinth - a maze of challenges, expectations,

priorities, demands, and recommendations shaped by internal and external forces - that leaders must navigate (Blustain, 1998). Internally, administrators and faculty are motivated by their commitment to social equity and improving the lives of students. Externally, legislators demand evidence of return on investment, linking institutional funding to performance. Nationally, non-profit organizations and peer networks advocate best practices, creating pressure on institutions to adapt and conform.

Some paths lead to dead ends - initiatives that fail to produce the desired student outcomes. Colleges may even languish in dead ends, neglecting to evaluate initiatives or terminate ineffective programs. Other paths, marked by successful interventions and promising results, suggest a way forward. Many paths originate in an institution's past, defined by tradition and rooted in a mission historically based on increasing access rather than student success. Successfully navigating such a maze requires institutional leaders to manage change in new ways. As one president observed, "at the end of the day, [everything] is how well can we manage a change agenda that is student driven. That's the question."

Participants described working to transition their institution from *old ways* - based on historical attitudes and approaches, to *new ways* - designed to address a rapidly changing environment and increasingly informed by data. The path of transition selected by leaders was different for each institution. What emerged as commonalities were the strategies used to seek alignment; all leaders utilized Programming, Resourcing, and Leading in their efforts. However, differences emerged in planning and execution. Within each strategy, especially Programming and Resourcing, dimensions emerged that

characterized actions as vague or defined, unstructured or structured, and based on evidence that was anecdotal or data-informed.

Managing Change emerged as a property of Seeking Alignment. The strategies of Programming, Resourcing, and Leading were limited or enhanced by a leader's ability to manage change. The ability to manage change, in turn, was impacted by three components of a leader's environment: (a) Change Capacity, (b) Change Pressures, and (c) Change Values. Change capacity framed an institution's *ability* to change, comprising the resources and limitations imposed by internal and external factors. Change pressures consisted of *pressures* to change exerted on an institution by external forces. Change values reflected an institution's *inclination* to change, influenced and defined by campus culture. Together, these three components determined not only what strategies were available to leaders, but the degree of alignment to student success objectives that was possible.

An additional concept that emerged, but was not expressly included in the theory, was that of a *frontier*. A frontier represented a boundary, defined by the limits of institutional knowledge and capacity. As knowledge and capacity increase - informed by new research, new practices, and new experiences - the frontier advances, constantly changing the goals and parameters for Seeking Alignment. Leaders embraced this ambiguity. Some described it as "exciting", especially in terms of expanding their opportunities to increase student success. The concept of a frontier provides a niche for CEA. As described in later sections, many leaders resisted prioritizing consideration of program costs in their decision making. Instead, they focused on implementing programs

they believed would serve students well and increase student success, regardless of cost. CEA supports leaders' focus on student success, while also incorporating consideration of costs. It demonstrates which programs deliver the greatest impact for the lowest cost, allowing leaders to honor their student success priorities while also maximizing the impact of their spending. A space for CEA in student success efforts, enhanced by advancing frontiers, is discussed in Chapter Six. The next section presents the detailed findings that informed the theory.

Findings

The findings that informed the theory are presented as follows: First, Managing Change, a property of Seeking Alignment, will be discussed with its components - Change Capacity, Change Pressures, and Change Values. Next, the three strategies of Seeking Alignment will be presented with their associated properties:

- Programming - Initiating, Operationalizing, Assessing, and Acting
- Resourcing - Experimenting, Budgeting, and Reallocating
- Leading - Prioritizing, Visioning, Catalyzing, Discerning, and Sharing

Managing change. Three factors shape an institution's ability to Manage Change: (a) Change Capacity, (b) Change Pressures, and (c) Change Values.

Change Capacity. An institution's Change Capacity reflects the *ability* to change, and influences how leaders manage change. Change Capacity determines which alignment strategies are available to an institution, how those strategies are implemented, and the degree of alignment possible. Change Capacity was influenced by internal and external factors.

Internal factors. Internal factors that emerged included time, institutional research (IR) capacity, expertise, mindset, and tradition. Depending on the situation at the individual college, each factor served as an advantage or a limitation.

- Time: Leaders expressed being time-limited. A vice president commented that "in my experience…you're so damn busy keeping what you've got running…do you have time to sit down and think about it? Rarely." Another vice president stated there was "never enough time."
- IR Capacity: IR capacity was an advantage to institutional efforts when offices possessed the staffing, expertise, and data systems to provide data support to student success efforts. However, it was a limitation for colleges struggling with understaffed and under-resourced IR offices. In addition, many participants complained about legacy systems - outdated software and database systems that made it difficult to gather, interpret, and utilize data in decision making. A vice president described their situation, "We're limited in the data. We've had such horrible systems, it's been limiting."
- Expertise: Expertise was also important in areas outside of the IR office. Again, it was an advantage or a limitation, depending on whether or not the college had personnel trained in desired skills, such as data use and interpretation. As discussed in another section, external mentoring was a factor in the level of expertise available to colleges.
- Mindset: Mindset was a central component of the culture of each college. Some colleges described a culture where members of the campus community were

supportive and enthusiastic participants in student success efforts. Furthermore, presidents and vice presidents relied on, and valued, faculty expertise. However, mindset challenges were also mentioned by many leaders. The limiting elements of mindset that emerged during interviews included:

- Resistance - Faculty resistance was often described as benign. Benign resistance occurred when faculty did not fully understand a change, or did not have appropriate professional development. Benign resistance frequently transitioned to support once faculty "understood what the vision was." Other types of resistance were more challenging, such as faculty and staff unwilling to consider new ways of doing "what they have always done." One vice president commented "that is absolutely where all the stuff usually ends up…the faculty is the one in the way, and a lot of stuff stops right there, it really does."
- Fear - Faculty and staff resisted changes when they feared their job, or a favorite course or program, would be negatively impacted. Fear was related to the use of data; faculty resisted the use of data when it was feared such data would reveal vulnerabilities in their programs: "Faculty would be a challenge. Not all faculty, but [some] faculty. I worked with this on the strategic planning effort. [Faculty] felt we should not be data driven…we maybe could maybe be 'kind of, sort of' data informed…."
- Silos - Leaders described the negative impact of silos when areas of the college worked independently, or competitively, instead of

collaboratively. This was often mentioned in relation to academic affairs and student services.

  - Lack of engagement - Engagement was defined as the broad participation of all areas of the college, with everyone sharing responsibility for student success. One vice president described their greatest challenge: "I think the biggest hurdle is people recognizing the importance of everyone being engaged in student success….And everything that each of us does has a role to play in the retention and persistence and success of students."

- Tradition: Many leaders identified tradition as the greatest challenge to improving student success. When asked about their greatest challenge, one leader responded "Well, part of it is changing the past. I think folks like to be in a state of equilibrium, they're comfortable with what they've always done." Another described moving away from tradition as a "huge culture shift" and observed "it's a big enough culture shift for students, let alone people who've been working in that place for five, eight, ten years." Because "change is hard" and "takes a long time", changing traditions to better align culture, practices, and programs to student success was a significant challenge for most leaders.

*External factors***.** External factors included mandates and partners.

- Mandates: Mandates emerged as a limitation when considered in terms of change capacity, (they will also be discussed as a Change Pressure in the next section). Mandates were top-down charges originating sometimes with senior leadership, but most often with external governing bodies. Mandates constrained the choices

available to colleges, and sometimes imposed challenging implementation timelines.

For example, corequisite remediation is a popular best practice advocated by student success networks. It requires a developmental course and a support course to be offered together, and is mandated in some states. Colleges mandated to implement corequisite remediation were limited in the strategies they could pursue, and even more so in what they could support financially. In addition, mandates often required specific timelines for program implementation. One leader described their challenge, stating "it's something we've been mandated to do. So it's kind of like we're making the soup as we're eating it. So that's one of the problems."

- Partners: Partners emerged as an advantage for Change Capacity. Partners included national student success networks (e.g. Achieving the Dream, Complete College America), software solutions, and philanthropic organizations. Partners provided valuable mentoring and training. Leaders described how partners guided their efforts in aligning program planning and assessment to student success objectives. Partner mentoring also increased the expertise available to institutions in using and interpreting data:

> When they come in and they visit, they give us new data, new ways to look at data, and that's what they're doing with us. We haven't fully utilized it, but what we're able to do is explore some new things and have conversations….We're in the preliminary stages…and so every time they come to visit it helps us expand a little bit more. We're trying to figure out how best to utilize it. And what that really means. It's a different language for us.

In summary, internal and external factors influenced an institution's ability to manage change, affecting which strategies were available to them, the degree of detail possible in planning and assessment, and the potential level of alignment.

Change Pressures. An institution's Change Pressures were external factors that necessitated change, or required a response from college leadership. As such, Change Pressures influenced how colleges managed change. Change pressures emerged in six categories: student preparedness, competition, policy, finance, performance and accountability, and community priorities.

Student preparedness. Rapidly changing demographics have increased the number of at-risk students entering community colleges. When traditional programs are not successful, colleges must change to meet the needs of new populations, and align their programs and services to 21st century student needs that often require extensive and expensive student support:

> So many students come to us with a broad range of abilities and we're charged with making sure that those students are successful and they complete and get a job or they go on and transfer, with the dollars that we have available. And we don't have a choice. Universities can pick and choose who comes in their door. We don't get to do that.

Competition. One president identified the increasing competition facing community colleges as a "wake up call". Competition for students contributed to declining enrollments, and an accompanying decline in tuition revenue. A vice president described what they were experiencing: "…there's more competition. In many cases we compete not just with community colleges, we're competing against universities and

now, in many places, we're competing against privates at an accelerated rate." Another vice president observed:

> We're being out-recruited, and we're being out-retained. In other words, the universities and state colleges are doing a better job of retaining students, using our model! And using what community colleges are known for…because some of us are kind of stuck.

Being "stuck" highlights the need to transition from old ways to new ways. As one president observed:

> We've tended to make decisions on policy and budget models that were probably okay at a point in time, but…the information that we have is so fast now, and everything is changing so quickly, and we need to have models that are more aligned with today's environment.

Policy. Policy mandates constitute another pressure for colleges, requiring compliance that college leaders may feel is not in the best interest of their institution. One leader framed the issue in relation to *15 to Finish*, a national campaign encouraging or requiring students to take 15 credits each semester:

> A great example is 15 to Finish. Hawaii did a 15 to Finish, so we should do a 15 to Finish? Well, that doesn't work for the community colleges here, and we've got leaders that aren't at this institution setting policy, advocating with legislative bodies, even against the practitioners of the campus that know their student populations better….You've got people setting policies that are perhaps not the best equipped.

Finance. Leaders at all levels referenced the pressures caused by declining state support, performance-based funding, and the need to provide more intensive services without additional resources:

> We basically had an open spigot, let's be honest, you know, [in the past] we got funded like there was no tomorrow, based on head count and FTE, seriously ….And now, funding is based on actual [performance] - whole new mindset.

As mentioned previously, state policies mandating specific programs also created financial pressures:

> The state requires a corequisite…in English and math now in developmental education…which means we have to have the resources to pay all the staff to provide those supports. If our reimbursement from the state continues to decline, we can't sustain doing what we're doing without sufficient revenue to survive. So it's that mismatch between money from the state, the needs of our students, and our mission to serve them. Particularly in developmental education, it's really tough.

A community college researcher and advocate noted the types of changes required to respond to current and future financial pressures:

> States are going to continue to cut funding. This isn't good, but the reality is we're becoming semi-privatized. So we have to move from a model where we generate enrollments by offering cheap, easily accessible courses to a business model where we offer affordable programs that actually lead somewhere.

Performance and accountability. External stakeholders and data availability emerged as change pressures for increased performance and accountability. External stakeholders included governing boards, national student success networks, and accrediting agencies. Governing boards attending conferences returned to their states or institutions with new requests after hearing best practices presented by peer institutions and non-profit organizations. National student success networks encourage participating colleges to implement specific best practices. Accrediting agencies increasingly ask for evidence of how college practices and programs are linked to student success, and "they have become more intrusive in what we do." A vice president referenced their work in responding to accreditation requests that they demonstrate "how we were aligning planning and decision making with resource allocation" to improve student success.

Accreditation requirements were also described as increasingly asking about competencies: "They're asking 'what are they learning?' They're asking us to define that in a much more intentional way than we have in the past."

Data availability encourages increased demands from external stakeholders to demonstrate performance. One president described the induced demands of data transparency with its impact on external pressures to improve performance and increase accountability:

> I think we're at a point where we're going to have to become more sophisticated moving forward. The data is going to drive us in a lot of ways. We could hide, even five years ago we could hide practices because the data wasn't there, but you can't hide practices now. The data is here.

Community priorities. Leaders were very mindful of their institution's community connections and obligations. Many described the pressure of changing workforce needs that necessitated changes in college practices and programs. For example, some leaders acknowledged that their institution's certificate programs were not aligned to current and projected labor market demands and needed to be re-evaluated. Others recognized gaps in the skills students acquired in technical programs compared to the skills sought by regional employers. In addition, some assessment processes were described as inappropriate for workforce programs, a misalignment that kept otherwise qualified students from progressing in a chosen field.

In summary, external Change Pressures in the areas of student preparedness, competition, policy, finance, performance and accountability, and community priorities influenced an institution's ability to manage change.

Change Values. An institution's Change Values reflected their *inclination* to change. Change Values framed an institution's alignment efforts, defining alignment targets and influencing how a leader chose to Manage Change. All the colleges participating in this study were members of national student success networks; as such, they were all committed to improving student outcomes; tracked success metrics such as course completions, retention, and persistence; and used data as evidence to guide their work. In the words of one president, "student success is what we do."

However, they also focused differentially on aspects of student success that reflected their campus culture and philosophy. Priorities that emerged during interviews included

- an emphasis on the student experience;
- hiring "people that care;"
- a focus on reducing student financial burdens;
- incentivizing students; and
- addressing non-academic student characteristics, such as self-perception and grit.

Alignment efforts at colleges with individualized priorities went beyond aligning programs to traditional student success metrics, and sometimes involved significant effort and investment. One factor that was specifically excluded as a change value was program/initiative costs; colleges were not working to align student success initiatives with reduced costs.

Change Capacity, Change Pressures, and Change Values all influenced how leaders managed change, and how they sought to align institutional efforts to student

success. Definitions and targets may change over time as national priorities, evolving demographics, and new research identify new targets. Even strategic consideration of initiative costs (beyond cost feasibility or revenue generation) - anathema to many leaders - may emerge in the future as a target of alignment if external pressures for financial accountability increase.

This section described how Change Capacity, Change Pressures, and Change Values affected Managing Change. Managing Change, as a property of Seeking Alignment, affected the strategies colleges implemented to increase student success. The next section will discuss the three strategies of Seeking Alignment.

Seeking Alignment. Three strategies emerged for Seeking Alignment: (a) Programming, (b) Resourcing, and (c) Leading.

***Programming*.** Programming is a strategy of Seeking Alignment. Colleges had many types of student success programs, including support services such as child care, food pantries, transportation vouchers, and study labs. In this study, *program* is defined as a discreet student success initiative implemented to increase student outcomes. Programs might be academic, curricular, pedagogical, or student support initiatives. Four properties emerged in the strategy of programming: initiating, operationalizing, assessing, and acting.

Initiating. Initiating comprised the first steps a college took in addressing a student success problem: (a) identifying a problem, (b) searching for a solution, and (c) selecting a solution.

Identifying a problem: Before searching for solutions, colleges must recognize or identify a *problem*, defined as an area where programming is not aligned with student success. Colleges recognized such gaps in various ways, including student complaints, poor student outcomes, and disparities in student success among various demographic groups. They also used national surveys, such as the Community College Survey of Student Engagement and the Noel Levitz Student Satisfaction Inventory, to identify aspects of the college environment and services that students rated poorly. These were seen as areas of misalignment. Once an area of misalignment was identified, the next step was searching for a solution.

Searching for a solution: Colleges searched both externally and internally for solutions. When searching externally, they looked to peers, best practices, conferences, and national networks. Peers were a popular source of ideas:

> We're always out there looking to see what others are doing. You're always wanting what the best practice is, or what an institution is doing. I don't think we ever copy an institution, but if we hear something, we might see how it might work for us.

Conferences were another source of potential solutions. One vice president commented on the role of conferences in disseminating ideas:

> I think they [conferences] are very influential….You've got groups like AACC, or ACCT…and then you've got ATD, you've got NACADA, you've got all these different organizations, and I think in many situations you get a similar flavor but not a consistent message. But I think they are very influential, especially when you look at the governing bodies attending these things and saying "hey, we need you to do this" and "this is what this school did so that's got to work."

Best practices were frequently mentioned as an important source of ideas, but with limitations. Leaders commented that best practices, especially those advocated by national student success networks, worked well for the average student but failed to meet the needs of unique student populations. One president observed that "a lot of the things you do around a student success agenda, if you're really following Complete College America, don't necessarily work in our environment."

Examples they mentioned included:

- best practices that require students to attend full-time when an institution's students are primarily part-time;
- advising practices that deliver the same level of advising for all students, rather than targeting the most intensive advising to the neediest students; and
- remedial practices that do not reach students placing at the lowest levels of math preparedness.

Whether ideas came from peers, best practices, conferences, or national networks, leaders described the need to adapt solutions found externally to their own institution and unique student body.

The need for adaptation was less of an issue when solutions originated internally. Many colleges had cross-functional teams comprised of faculty, staff, and administrators from diverse areas of the college. Charges to these groups varied, and included identifying problems, searching for solutions, program implementation, and program evaluation. One president commented that their student success ideas are often:

…based on our people, and what they've experienced with our students.

> I think we've reached a point where best practices only benefit us a limited amount because a lot of it we've tried, and we are constantly in continuous improvement. So while we see what's going on out there, it really is "Well, what works best for our students and how do we try something that way." We really rely on a lot of innovation within our own people.

A vice president at a different institution expressed similar thoughts:

> We start with the premise that higher education has not succeeded, so that basically if we do the same thing that everybody else has done, it's not going to work. Because we already know that if it did work, we'd all be doing the new thing.

Innovating from within also helped to reduce *initiative fatigue*. Initiative fatigue occurs when a large number of initiatives are introduced over a short period of time, with faculty and staff investing less effort and support into each new initiative. Initiatives proposed from within by college committees with broad representation facilitated a sense of ownership.

Several colleges described initiative fatigue as the old way, and guided pathways as the new way. Guided pathways is an approach that streamlines academic programs, connects individual initiatives to provide integrated student support, and defines clear paths to a degree or certificate for students (Jenkins et al., 2019). One vice president observed:

> [In the past] you came up with something new, but you had no idea if it was going to work, or why, and everybody was coming up with the fad of the year type thing….But nobody knew what to do to really improve things. Until guided pathways came along I don't think anybody had an answer, because every college in the nation was kind of doing the same stuff, and no one was having any success.

As mentioned previously, the colleges that participated in this study were members of national student success networks; as such, they had up to 12 years of experience with

student success initiatives. Many were already considering or implementing guided pathways.

Selecting a solution: College practices for selecting a solution varied in the factors considered, the level of detail in the selection process, and how pilots were used. When selecting a solution, factors mentioned included demonstrated effectiveness, scale of impact, return on investment, whether or not the initiative enhanced what they were already doing, scalability, and suitability for their student population. For some colleges, old ways involved trying initiatives almost randomly in hopes that they would be effective. One vice president described their old practices in selecting interventions: "I think we have gone beyond the days of … throwing spaghetti on the wall and seeing what sticks. I mean, I think we're beyond that, finally. Which is nice."

The level of structure and detail in the selection process also varied, from vague and rhetorical to defined and structured. One leader described their process as "data-informed to a certain extent, but it's not as comprehensive as it could be." Another said they could "use a more in-depth system, maybe a system with more metrics." In contrast, a leader at a college with a very structured and defined process described how they select solutions:

> So, we first do research, we collect data….[we] listen to best practices, where…community colleges like us have data that shows that that best practice really has been effective. We try to do as much as we can at scale. So once we choose a concept, there's a vetting process that touches all the stakeholders that will be affected by the initiative. Primarily faculty….to make sure that the concept will stand up to the review of faculty….So it's vetted from the bottom up.

Another area where colleges managed change differently was in the use of pilots. Some institutions implemented pilots with little to no consideration of their scalability, or how they fit into the culture and long-term goals of the college. Others, particularly those with a long history of participation in national student success networks, were very intentional in using pilots, as described by a leader at large institution:

> A lot of times we will….pilot a strategy or intervention, and we will determine its effectiveness, and for those strategies that we find to be effective in terms of moving a needle in student performance, for example, we will determine the cost to run the pilot, and we will sort of weight the cost benefit. If there is enough benefit in terms of student performance or students meeting milestones or whatever the success measure is identified for that particular strategy, then we will make a decision on the basis of how much that intervention would cost going full scale….Knowing which intervention will give us the biggest impact [is important], so there's a lot of piloting.

Colleges with a long history of student success work also focused more on initiatives that enhanced what they were already doing. They described their institutions as "initiative rich", having moved beyond initial student success efforts that may have involved a plethora of diverse initiatives. One president described the situation at his institution:

> When we look at new programs, what we look at first is do they enhance the items that we're already working on. Again, we've gotten to a point where we've had lots of opportunities and we're at a point, just based on the population that we serve and some of the results that we've had in the past, where we say "no" to new programs unless it enhances the focus areas that we're already working on.

Once a solution is selected, colleges must operationalize the initiative or program.

*Operationalizing***.** Planning for implementation included considering resources, goals, assessment, campus culture, and facilities; and varied from vague and undefined to structured and carefully defined. Some colleges implemented initiatives without careful

planning, not realizing the scope of the resources needed until the initiative was already underway. A vice president whose college had to defer implementation of an initiative beyond the original target date due to inadequate planning commented:

> I really believe that's one of the reasons we deferred full implementation of [initiative] until next fall, because nobody stopped to think about "Oh my gosh, how are we going to do this?" Just didn't think about it. We're just thinking "Oh, this will work" and if it works we can just scale it up.

While most colleges considered cost feasibility before implementation, some did not do so consistently. One vice president explained:

> A lot of times the people making the decisions don't understand the hidden costs, [that] if you don't do it a certain way, the price you're going to pay, you know, what things actually cost. I find that particularly true in instructional areas where it's hard to attach a price, but it takes up somebody's time.

Another leader described their planning process as "data informed to a certain extent, but it's not as comprehensive as it could be."

Alternatively, some colleges used structured and detailed processes in their planning:

> We cost it out to see what would it cost, what is the staffing, what are the facilities, what the associated cost would be….So once it gets to the [senior administration] we know that the finance office has looked at it. If legal needs to be involved, they do what they do. Research does what they do….When it gets to [senior leadership] we know how much it costs, we know the projected timelines, we know who the audience is, we know what the outcomes are supposed to be, we know what the assessment metrics are going to be….

It was not the focus of this study to explore potential correlations between years of experience with implementing student success initiatives and the degree of structure in implementation planning. However, a potential correlation was observed.

Assessing. Assessing is defined as when and how colleges evaluate (or plan for evaluating) their student success programs. The *when* of evaluation ranged from before implementation to after implementation to never. The *how* of evaluation ranged from undefined to clearly defined. Undefined processes had *fuzzy* metrics - leaders had a general idea of what they expected to happen, but did not define specific metrics for evaluation prior to implementation. In contrast, clearly defined assessment plans identified evaluation metrics and timelines prior to program implementation. *When* was often correlated with *how* - colleges that planned for evaluation before program implementation usually had well defined metrics in place.

For example, one leader explained:

> We know what the metrics are for the programs. That's, frankly, the first question when something comes forward….where are the metrics, how are we going to evaluate whether this is effective or not? If it's not in there, it gets sent back.

However, the assessment planning process (excluding grant-funded programs) at other colleges varied widely. Many colleges implemented initiatives without first designing an evaluation strategy and identifying metrics. Comments from leaders included:

- "Assessment and evaluation is always a big topic. And everybody wants to do it, and we do do it, I'm not saying we don't, but it's typically after the fact, and it's not up front."
- "We measure success by how it moves the needle, like on retention and graduation…and we're trying to do those effective pieces, but we do that after we've already invested in setting it up."

- "Do we have [data] to document whether or not [that program was effective]? We can't, because that was not in the design."
- "If we had made the decision [to implement a specific initiative] with a goal, what an expectation would be…we might be able to do some better analysis for whether or not it's having an impact."

Others described discussing evaluation, but not clearly defining metrics:

- "We talk about it, but they [metrics] feel a little…a little kind of lukewarm…so they need to be probably harder outcomes."
- "If it's a grant activity, of course we've identified those [success metrics] in the grant….In others, it's hit and miss."

In the absence of specific metrics, program evaluations were sometimes based on instinct and observations. One vice president commented: "I just feel, with no data to support it, that it's been effective."

Some initiatives were never evaluated at all:

- "Is there follow-up? Because, you know, we start programs and when we start a program we don't go back and review it, we don't. Have we done that [evaluate student success programs] very much? No."
- "We don't really have anything [evaluation] in place for our initiatives….We have things for programs, and we have things for courses, but we don't have anything for these initiatives that we're doing for student success."

Many colleges were in transition, moving toward a more structured approach to program evaluation as they transitioned from old ways to new ways. The colleges in this

study, as participants in national student success networks, had access to mentors. The mentoring process often included using data to inform a continuous improvement cycle. Continuous improvement was mentioned frequently as central to an institution's student success work. At one institution, creating a structured and clearly defined evaluation plan prior to implementing an initiative was a priority. Their work toward this goal included addressing many initiatives at the institution that had never been evaluated. These included both departmental initiatives sponsored by faculty and broad, institutional initiatives implemented by senior leadership:

> We are trying to evaluate all the initiatives that have been implemented since the beginning….are they being evaluated, do we have data on those initiatives that show that they're impactful, and [are] they impactful?...As we went through the process, we noticed that many of the initiatives [were] not being evaluated… I would say the majority of our initiatives.

In response, they were evaluating all previously unevaluated initiatives, and developing a rubric for all new initiative proposals that required the submitter to define the targeted problem, the intended audience, which institutional strategic goals were supported, and the evaluation plan.

Assessment is not always straightforward. Student success metrics can be identified for discreet initiatives, facilitating evaluation of individual interventions - but it is more challenging to measure the effectiveness of specific programs if they are part of a holistic approach such as guided pathways. In response to research, and the advocacy of national student success networks and organizations, many colleges are "moving away from single interventions and more toward a holistic system." This makes it difficult to assign responsibility for outcomes to one specific intervention: "You've got so many

different pieces of your student success agenda, which one of those is really causing this to happen? So I think that's where there's difficulty, in breaking things out…because everything is so interrelated."

Acting. Once data is available on student success program effectiveness, colleges must decide how to use the information. Many colleges described historical patterns where, once in place, programs were continued "in perpetuity" regardless of their effectiveness. As one vice president observed "we have a very difficult time letting go of what we've always done." Another described the reluctance of leadership to terminate an ineffective program in order to fund a new program, explaining that instead "they ask 'where's that money going to come from, how will I pay for that?' Because that's the mindset. They always add. They never think in terms of getting rid of stuff they're already doing." While many colleges routinely required evidence of effectiveness before scaling an experimental pilot program, terminating an existing or long-standing initiative was described as more difficult. Reallocation, through program termination, was an area where colleges expressed interest in knowing what their peer institutions were doing.

This section described how colleges sought to align their programming with their student success objectives. The next section describes how they fund their programming, and seek alignment through Resourcing strategies.

Resourcing. Resourcing is one of the three strategies of Seeking Alignment. Resourcing explains how community college leaders fund student success programs. Leaders considered student success program costs primarily in terms of cost feasibility; if they could find the funding for a desired program, they implemented the program. There

was little to no focus on maximizing the effectiveness of their spending as a way to align resources with a student success mission. In fact, many leaders expressed concern that overemphasis on financial considerations would dilute the focus on student success:

> This is what happens when we allow finance to have too heavy a role, right. In the same way as when we allow IT to lead discussions about the website. The website is supported by IT, it's not owned by IT….Finance is there to support the programmatic direction of the institution.

However, within a framework of cost feasibility, they did view resource allocation as an important form of alignment, funding first those programs that were considered "mission critical."

Leaders referenced three funding mechanisms - new funds, existing funds, and reallocated funds. These funding mechanisms constituted the three properties of Resourcing - Experimenting, Budgeting, and Reallocating. Conflicting dimensions often emerged within a property, such as structured versus unstructured, vague versus defined, and collaborative versus competitive.

Experimenting. Many colleges emphasized the importance of experimentation and a willingness to take risks with student success initiatives:

> We have…a committee tasked with coming up with interventions, whether it's on-boarding, or keeping students on path, or graduation or transfer - so the ideas will come from there. Like a lot of institutions, we will do pilots around some of those. And cost is a little bit of a factor there, I mean if it comes in and it looks like it's going to be unreasonably expensive we won't do that, but we're pretty open to trying things that cost a little bit of money to see if they're going to be successful.

Another president described how important risk-taking was in their culture and values, specifically taking risks to improve student success:

> There was also some concern that we had been through so many budget cuts that we had limited innovation because we were afraid we didn't have dollars to take risks, and so we really tried to capture that in the values….so you hear it on a very regular basis…our values, the role of innovation, being willing to take a risk, and then we'll adjust if it doesn't work.

Due to tight budgets with few available funds for trying new ideas, colleges often funded their experimental efforts through grants and set-aside funds.

Grant funding: Grant funding was often used for new initiatives. Grants were seen as a desirable resource primarily if long-term sustainability of the program was assured first. This was clearly an area where colleges were managing change, transitioning from old ways to new ways. Old ways included a system where sustainability was not considered, resulting in implementation of programs too expensive to be continued once the grant ended. New ways prioritize sustainability, implementing only those grant programs that the college can continue on its own if the program is successful. One president described the old ways as a "weakness on our part". He went on to say:

> What people fail to realize is that grants are seed money to start something. The whole point is that if it works…you're supposed to institutionalize that, and therefore the costs…are supposed to be garnered by the institution over time. And I think this is part of the old system where people didn't realize that they'd implement the grant, then the resources would go away, and then the program would go away. Well, that's not the intent.

Another observed:

> We see this all the time with pilot programs in community colleges. If you looked at it from a cost perspective, you'd say 'gee, I've got a grant and I'm spending $10,000 per student to get a result'. So why would you ever even do a pilot project like that?

The colleges interviewed for this study were at various stages of transitioning from old ways to new ways. Those with the longest history of participation in student

success networks had processes in place to consider sustainability before accepting grant funds. Leaders at one college that routinely analyzed sustainability before implementing grant programs described their approach:

> We may have various strategies in mind to scale it, in terms of funding. But we always think about if we were to want to move this beyond a limited scope, how would we do it, what would our strategy be, and where would our funds come from.

Others were in the process of transitioning, realizing that sustainability needed to be a priority, but still working with grants that could not be institutionalized. And some did not consider sustainability in a serious way before starting grant-funded programs. The vice-president at a college that did not analyze scalability of grant-funded projects described their process during an interview:

> Researcher: What do you look at when you think about sustainability?
> Vice President: What's that intervention going to cost during the external funding period and is there enough money within a reserve, or within a current budget structure, to support it going on. It's very elementary.
> Researcher: What is the answer usually?
> Vice President: The answer is usually "no"…or "we don't know".
> Researcher: You go into it with that much of an unknown?
> Vice President: Absolutely. Absolutely. And isn't that ridiculous.

Set-aside fund: Grants were not the only source of funds for experimenting; many colleges provided funding for internally proposed initiatives through funds set aside specifically for that purpose. While the size of the funds varied from college to college, the purpose was similar - to support faculty, staff, and internal committees in proposing potential solutions to student success issues. These funds were often assigned to vice-chancellors and vice-presidents to support initiative proposals originating within their areas, and to be used at their discretion.

Budgeting. Budgeting is another property of Resourcing. Resource use reflects an institution's priorities. As such, budgeting is a central component of transitioning from an access mission to a student success mission. Some colleges were in the early stages of transition; they recognized gaps in their budget alignment and were either exploring how, or just beginning, to address the gaps. Others had already identified gaps, and were refining their alignment processes. Two aspects of aligning budgets to student success emerged from the interviews - processes and interactions.

Processes: Processes were described as structured or unstructured. The most structured processes involved written demonstration of alignment, and frequently relied on evidence to support allocation requests:

> These are the objectives. I have them on the wall. When we do our planning we have to show in our budget…the budget line, those dollars are going to be supporting which of the strategic objectives. So we have to identify which ones those are. And so when we turn in the budget, you could actually pull a report and show for academic success, we're spending X dollars on strategic initiatives number one, or number five and number six.

Furthermore, goals were clearly and explicitly identified:

> What we do every year is we put the budget wrapped around this [student success], so when we do the budget presentations that's how we present it. We go "Okay, here's what we're going to do for student success. This is our goal. And this is how we're going to do that." For example….we're trying to [describes a specific goal and their short and long-term plans to reach the goal]. So just about everything that I think about is some kind of formula that we use or some kind of ratio….

In addition, structured processes evaluated the impact of previous budget cycles. One leader described how they evaluated their progress during the year:

> We had a print out of our budget with our goals and objectives, and where they align from what we spent last year - so we're doing mid-year check-in to

> see how we're doing. [Later in the year] we'll have a more detailed print out that shows where every dollar goes, that's under each of those objectives, and how we spent the money, whether we met our objectives….Do a "here we are", a summary of "okay, how did we do this year" and "where do we need to make improvements" and "where do we need to move money to support those improvements."

Some colleges used only anecdotal evidence to support budget allocations. When asked what evidence they brought to the table to support their budget requests, one vice president answered "My mouth. Probably not enough…I don't know…the evidence is my mouth and my passion. I don't bring data. I probably should, but I don't." Another vice president observed that student services requests were treated differently than academic requests; student services was required to provide evidence of effectiveness when requesting funding, while academic affairs was not. They suggested broad use of evidence to support allocations:

> One thing we don't do in higher education is TQM (Total Quality Management), and that's been around forever, but we could use that model to improve how we resource our dollars, how we spend our money, and how we allocate our funding. If we were in TQM mode with all things, then we would be able to see which programs are worth the investment.

The impact of making budget decisions without evidence was summarized by a vice president who lamented the constraints on budgetary decision making, including lack of time and lack of data. When asked if they frequently made decisions without the information they needed, they responded that they were "flying by the seat of our pants…and we continue to fly by the seat of our pants."

Colleges just beginning to transition recognized that their budget processes were a continuation of how they had always done things, and a change was needed. When asked

how their college aligned resource allocations to their student success priorities, one vice president responded "I wish that was a little more structured." Another observed:

> One of the challenges is that at this point, this college hasn't directly tied resources to those outcomes. And we're poised right now to really make that shift....and so we're not there yet. We know we need to do it.

To begin the transition, the budget office was redesigning their form to "more clearly align, to help guide people…a new process to guide them through the budgeting request process."

Colleges using a roll-over budget also commented on the limitations of the process in strengthening alignment to student success. One president observed:

> Most of us…most policy makers…are using kind of, for budgeting decisions, protocols that are more administrative models than educational models. Flat line - this is where we were last year - you start with that and you make adjustments. Very few zero-based kinds of reviews.

Another vice-president described their roll-over budget process, and the renewal of funding for programs regardless of their effectiveness. When asked if there was any interest in considering program effectiveness before rolling over funding to the next budget year, they responded "There should be, but there's not".

Interactions: Interactions were described as collaborative or competitive. Many colleges described a very collaborative budgeting process. Strategic objectives were communicated to all departments and mid-level managers, and resource allocation committees with broad representation from all areas of the college made final budget recommendations to senior leadership. Many leaders described the collegiality and collaborative atmosphere that marked their senior level budget meetings, acknowledging

the needs of their colleagues and often sacrificing their requests when they felt those from another area were more critical.

Other colleges described a more competitive atmosphere that included "pet projects" and unequal treatment of student affairs and academic affairs.

> You have to keep in mind that first and foremost many college presidents consider that academics is clearly more important than student services, and therefore student services is often the last to get resources. So there's always that competition, if you will, for dollars.

The academic vice president at another institution described a similar situation, observing that:

> Student affairs has been raped, pillaged, and plundered for too many years at [this institution]. And that's part of our problem. I mean, we just take them for granted. And we have not cared for them very well.

Finally, silo mindsets and resource guarding were described by some leaders as interfering with alignment to student success priorities.

> I think the biggest hurdle is people recognizing the importance of everyone being engaged in student success. It's not all student services, it's not all academics, it is everyone's job to promote student success….Silos are deadly…that's a major barrier and leads into issues with the budgeting and the financials of it all, because we are courting our budgets. But we forget the money is generated by students for students, so how can we better utilize these funds to meet the demand. So it's those silos that are deadly. And it's…deadly to the budget allocation process.

Reallocating. Reallocating resources from less effective programs to more effective programs was an important source of funds in times of fiscal constraint. One president observed:

> It's hard work to reallocate. It's a lot easier to get new money to expand…. But at the end of the day you've got to find the tools to reallocate because there's not a lot of new money coming our way.

Financial challenges prompted colleges to consider program termination in order to "fund what you believe in" and created a Change Pressure that resulted in leaders either considering, or working toward, expanded use of reallocation strategies. The most common sources for reallocated funds were retirement incentives, salary savings from unfilled positions, and finding efficiencies in college services. These were referred to as "fiscal sweet spots." Terminating programs served less frequently as a source of funds for reallocation, and leaders spoke of the challenges in terminating programs. Leaders were struggling to manage change as they transitioned from old ways to new ways of resource allocation that included reallocation. Two areas of challenge emerged - processes and mindset.

Processes: Most of the participants did not have defined processes for termination of ineffective programs, either academic programs or student support programs:

> We have our program review process…but once we have a program established, as long as it meets certain baseline metrics…we don't actually go through a really strong process to say, "you know, our dollars would be better spent by expanding Program B and reducing Program A." We don't, unfortunately, do that.

Others did have defined processes, particularly for academic programs. The processes were transparent, metric based, and often peer led. As one president described:

> Faculty basically drive that process and so it's peer to peer, and it's a well-defined process that everybody's aware of. And metrics and data are used, so there's no surprise when that [program termination] happens.

However, few had a process for student services programs where evaluation metrics may not be identified. One president stated "when you get into student services it's a little more unclear."

Participants were in various stages of transitioning toward utilizing program termination as a source of reallocation funds. Many were either discussing or working toward such processes. They described two requirements to move in that direction - discipline and evidence. One president stated:

> Reallocating…is hard work for us, and where the evidence comes in is to have the discipline to start programs and to grow programs that we know are in high demand…with waiting lists and jobs….But we don't grow them because we're carrying so many other programs.

Another leader stated that evidence was necessary to justify program termination to faculty:

> You're going to have resisters on your campuses when you're introducing something, especially if you're taking the resources that they wanted to have their hands on….We have to prove that…the expected outcomes are going to be…in simple terms, money well spent.

Many also expressed an interest in discovering best practices in resource reallocation, and learning what their peer institutions were doing. A leader whose college seldom terminated programs stated:

> What we don't do a lot of is let's say I've got two programs and they both cost the same amount of money, but one of them serves half the number of students. We don't actually go through a reallocation process per se, but I would be curious to know what other institutions would be doing around that.

A significant challenge in considering program termination as a source of reallocation funds is the lack of program planning and evaluation. A vice president

described a process that was not happening at their institution, but that they envisioned happening in the future:

> We're going to sit down together and say "this is what we're going to need in year one and year two and year three. Here's how we're going to deploy that - we're going to come back and determine up front, should we evaluate this on a semester…on an academic year…or should we evaluate it based on the core sequencing that students need to take?" We're going to evaluate all those things, we're all going to know up front what it means, what a success means, what does investment mean. We're all going to approve that…and in the end, if we don't see that it made the difference that we intended, we're going to cancel, and we're going to make that hard decision. We're not going to let it go on in perpetuity because it was something that we tried.

Without identifying success metrics and evaluating program effectiveness, it is difficult to determine which programs should be terminated, continued, or expanded. As colleges work to manage change and transition to a new way that utilizes resource reallocation, those that do not have a detailed and disciplined approach to evaluating programs and initiatives will not have the evidence to support reallocation decisions. This will be addressed in a later section.

Mindset: Leaders described the challenge of traditional mindsets that did not support reallocation. Mindset affected both faculty and leadership. Historically, years of abundant funding in the 20th century created environments were colleges could afford to expand into areas of faculty interest, where faculty were accustomed to program funding renewals year after year without consideration of effectiveness, and where presidents focused on requesting new funding for expansion. Transitioning to times of financial scarcity and a student success mission challenged these mindsets, requiring colleges to manage change as they move from old ways to new ways.

Faculty were described as often resistant to reallocation efforts - protective of their favorite programs and courses, and fearful that reallocation would impact their job. One president described:

> I think there's always challenges in that [reallocating] because nobody… you know, people are usually passionate about what they're doing, and so when you reallocate away from something you're basically saying that it's not working as well as it could or should.

Another commented:

> It's always hard to stop doing something that you've been doing. And, there's always some kind of…somebody's got a really emotional tie to it…and so, that's hard to do….There's a lot of emotion around repurposing.

Resistance to reallocation was not limited to faculty. Community college sector leadership in general was described as frequently seeking new funds rather than repurposing available funds. In addition, several vice presidents described reluctance on the part of senior leadership to pursue terminating programs:

> If they're senior administrators, they'll start seeing that's going to blow up the school. That's really going to disrupt things, and if they decide to go ahead and move in that direction, they're in for war. Or they're afraid they might be. And typically they're right.

Transitioning to a new way that embraces reallocation requires changing mindsets. For leaders, that included accepting responsibility for making hard decisions:

> We're having to take money away from one area to start something new and that's a painful process….This happens at the highest level, and we recognize that that's our responsibility. But that's not always something that people understand and they don't want to hear it.

Several leaders described the need to communicate student success needs to help faculty support reallocation efforts:

> We have a full-time administrative person who sits in this space, and looks like the Maytag repairman. And I have departments right now that are crying out for administrative help, they don't have enough resources. So it's a matter of getting people to rethink how are we utilizing what we have, and how does it impacts students.

And,

> The college is aware that the funds we're receiving are being cut, especially from the state. And so we have to be really thoughtful in how we're going to distribute those funds to anything that is going on in the college….Which of these initiatives are worth…I'm not saying they're not all worth it, but showing if they're impacting student success…maybe we want to distribute our funds more to one program compared to another [that's] not helping students at all. It's just revaluating where we want to allocate our limited resources. So we know that needs to happen. It's just trying to get everybody else on board to see it the same way.

In addition, there can be a need to move forward more slowly than desired in order to garner support from the college community:

> Do you want to be the destructive wave that just kind of comes in and says "I'm the boss"…or do you want to create a positive ripple? I can go 100 miles an hour and get to where I'm going all by myself, or I can do about 35 miles an hour and take people with me.

In summary, reallocating is a dimension of resourcing where colleges are managing change as they transition from old ways of resource allocation to new ways of resource allocation that include repurposing. Old ways involve seeking new funds rather than reallocating existing funds, mindsets of resource guarding, and processes that do not terminate ineffective programs in order to fund more effective programs. Most of the colleges interviewed for this study were moving toward a new way - evaluating programs before continuing funding, strengthening understanding of student success needs among faculty, and finding the mindset and discipline to terminate ineffective programs.

Leading. In addition to Programming and Resourcing, Leading was also a strategy of Seeking Alignment. The properties of Leading reflected how community college leaders defined their role, established institutional priorities, and influenced campus culture. The properties of Leading that emerged were Prioritizing, Visioning, Discerning, Catalyzing, and Sharing.

Prioritizing. Through prioritizing, leaders established the framework for institutional activities and decisions. Every leader participating in the study framed their efforts around students; student success was the priority in everything they did. As one leader stated "we must put them first, always first, in everything that we do." Leaders set the tone for their campus by prioritizing student success. Student success took priority over financial concerns. Comments included:

- "We didn't do a lot of cost analysis surrounding that, there wasn't a lot of funding tied to that. But the institution saw that the outcomes would be so important that we just decided to go into it."
- "The idea that [a stakeholder] would ask me when [a program] is going to break even implies to me that [they] completely missed the point."
- "Financial data did not enter in…as a characteristic….When you begin talking about social justice needs, and the ways in which programs work to respond to those kinds of things, you've changed the conversation…."
- "I kept hearing 'when is it going to make money?' It's like 'those are all the wrong questions, stop asking the question'."

One president summarized the recurring theme in every college conversation: "Everything that we do has got to be understood in terms of student success."

Visioning. Visioning was a leader's role in looking toward the future, in seeing what others did not see, and in having the courage to move the college in directions that others might not initially understand. Examples included:

- Terminating a popular program: Despite the sadness expressed by the community, when program costs could not be justified in terms of a student success mission. When the question became "Is this really where we see this institution for the future?", the answer was no.
- Expressing the need to change how budgeting was done: The leader described "going beyond the traditional and tying some research and some impact analysis and then creating a framework of change that may lead to … more sophisticated budgeting processes."
- A call to action: "We need our leaders to say 'Okay people…let's get this done….What does that change look like…and how do we get there'."

One researcher described the leadership vision required to implement a specific student success approach - guided pathways - early in its history:

> …in the short run, it's a huge risk to these up-front investments. And especially if you're a new president….It takes at least two years, probably five or more years, to lay the groundwork for this kind of change, to get your board on board, your faculty and staff leadership, get everyone on board. And then you have to make this investment at a time when states are cutting and enrollments are down, and initially you'll see a dip in enrollments. Like a couple of presidents said, "it's costly, but it's the right thing to do for students." And there's a belief that in the long run this is how colleges are going to survive.

Discerning. The property of Discerning was similar to Visioning, but more focused. In Discerning, leaders recognized gaps or inadequacies in policies and practices that "left students behind" or threatened the efficacy of an approach. Gaps and inadequacies emerged in several areas, including weak success metrics, normed best practices, and misguided policies. Internal efforts such as strategic and management planning were also mentioned.

Student success metrics: One president cited the inadequacies of student success metrics - inadequacies that made it difficult to measure broader definitions of student success than those commonly endorsed by the higher education sector. The absence of adequate metrics also impacted students, assessment, accreditation, and the effectiveness of performance-based funding policies:

> If you want numbers, many times institutions can figure out the numbers game without really changing what's happening. It then becomes a numbers game, it becomes a political jockeying game, and that's because we don't have the assessment tools to go back and talk about student success.

Normed best practices: Policy weaknesses were also mentioned in relation to interventions that failed to address the needs of the most at-risk students:

> Much of the national literature that's out there for interventions, for student success, is not going to work for them. They need a much higher investment ….The model that's out there is not robust enough, I think, when you're looking at the kind of policy decisions that are being made….25% of [students] we're leaving behind, and my sense is that if we're leaving them behind it should be by policy and not by accident.

Leaders also described the financial inefficiency that resulted from implementing normative interventions, such as broad advising policies requiring all students to interact

with an advisor when not all students need intensive advising. Targeting interventions allowed money to be invested where it was needed most. A president explained:

> Most of the time, especially administrators that don't have the deeper dive kind of background, and presidents sometimes are very policy-centric, [we don't do a] deeper dive into the data. And so the issue of where will we find the money comes up a lot….for me [it is] how to use your resources the most effectively, and it's got to be very real in terms of what's going on.

Some presidents emphasized characteristics of student success not always addressed by interventions designed to improve curricular paths and academic support. Several addressed the importance of students' perceptions of their educational experience and their self-efficacy:

> We have focused more on policies and processes and pathways and programs and we've lost sight a little bit of what the student input variable is….It's much easier to fix a pathway, align a curriculum, to change a policy, or create a new program, because we can do that. It's much harder to begin to create an experience to change somebody's belief.

As such, several colleges were focused on improving the student experience and non-academic characteristics such as resilience.

Strategic and management planning: Strategic plans were described as "a big thick book" that "nobody ever uses." One leader who had served on accreditation teams explained that many colleges' assertions that they align activities and budgets to their strategic plan are supported only on paper, not by actions: "I've seen strategic plans that aren't aligned to anything. You're saying you're going to do one thing, but if you look at the programs that you're offering, it's the same programs (year after year)." Participants in the study described moving beyond strategic plans that "sit on a shelf" to plans that guided their alignment efforts. Several also described simplifying their strategic plan -

"What I wanted was just five simple things…and we developed this whole card that could fit in your pocket."

Leaders also discerned potential opportunities and problems by relying on their "gut instinct." One leader described slowing down an implementation until they were sure everything was in place to support a successful program: "I've held us back a little bit until we had more of a phased plan, because you don't want to just go and put all these resources in, and not be able to manage it."

Catalyzing. Leaders acted as catalysts at their institutions, inspiring and shifting mindsets as they worked to establish a culture that embraced change. Cultural values they espoused included innovation, risk-taking, evidence (use of data), alignment, and campus-wide engagement. Many described the challenges they faced when first arriving at an institution - faculty resistant to change, departments unwilling to move beyond historical ways of doing things, traditional mindsets, and silos. However, sometimes a campus was open to change:

> It was a time when everybody was open to change, to a cultural shift, and they were hungry for it. And so that was kind of the best of times, the worst of times. You know, we've got to turn this around and they were ready to do it.

One president summarized the critical role that culture played in aligning college efforts to a student success agenda: "It's got to be a culture base….When decisions are being made with a student center, a lot of things are going to move. A lot of things."

Catalyzing also involved setting the direction of the college. One president who worked to shift their culture to a student center described the questions they posed to their campus community: "What is extraordinary? What is an extraordinary experience? What

is an extraordinary classroom experience, advising experience? Anything we do, what makes that extraordinary, and then how do you create that? What does that look like?" Another leader described the work required to create a culture of change as "disruptive leadership." He explained that "you have to change things up to make change."

Depending on the situation, leaders chose to approach culture change with patience or with mandates. One leader described a challenging culture shift, and the patience required to gain faculty support rather than implementing a top-down mandate. One approach included preparing faculty for the challenges associated with a change. A vice president described explaining to faculty:

> There are a lot of us bumping into each other in kind of a crowded room. We're jostling a bit, and we're stepping on each other's toes, and like being at any event where there's that kind of activity, you stop apologizing to everybody you've jostled and you just accept the fact that you're going to kind of bump into each other. That's what this year is going to feel like.

In contrast, another vice president described choosing to address a mindset challenge more forcefully:

> What's not there is the mindset…that's the struggle. That's the frustrating part. At the last deans' meeting, I let them have it. I said "I'm not going to put up with this. I'm not going to put up with the attitude. I'm not going to put up with the facial expressions." This is one institution, and that fact that we don't operate the way we used to is not my problem, and it's not their problem. They're just going to have to deal with it.

Some leaders acted as catalysts when they proposed bold, new ideas; ideas that involved risk, long-term commitments, and/or significant investments. They acted as instigators and advocates, working to get their governing bodies and campus communities on board with their ideas. They also maintained momentum:

> You can sit around and hug each other all day, or you can just keep plowing ahead until somebody tells you you can't do that the way you're doing it…which is fine, I don't mind doing that, you wouldn't be the first person to tell me that.

Sharing. Sharing occurred through sharing information and sharing responsibility. In sharing information, leaders communicated both verbally and through data to increase alignment to their student success mission. The purposes of communication included:

- Conveying information: Information was conveyed to governing boards and legislators; information was also conveyed to faculty in meetings and through technology. Convocation was mentioned as an important time to convey college priorities to the campus community.
- Increasing understanding: Leaders described reducing faculty resistance to a specific change through communication, helping faculty understand the student need and their role in helping students succeed.
- Simplifying: In one example, media (such as brochures and note cards) was prepared to present college priorities and objectives in a concise and actionable way.
- Data transparency: Leaders described efforts to make data available to all personnel at all levels of the college.

Sharing responsibility included collaborating, delegating, and training. Collaborating was described as desirable at all levels of the college and enhanced aligning activities and programs to student success. One leader commented that aligning resource allocation to strategic objectives "all hinges on your relationship with your other vice presidents." While many leaders described budgeting as a collegial and collaborative

effort, others described resource guarding and inequitable allocations. Competition both resulted from and facilitated a silo mindset. Competition occurred between senior level leaders from different areas of a college, as well as between different colleges within a district.

Delegating occurred as chancellors and presidents delegated responsibility for alignment to vice chancellors and vice presidents, and as senior leaders delegated to deans, department chairs, and faculty. One president described the role they envisioned for leaders at all levels:

> Part of my job is going to be to have the conversation about what should be the variables and the indicators for making decisions. But my sense is that decisions have got to be made at the chair and at the dean level, not at my level….We've got to push down kind of the whole, and we've got to make sure that our leaders have the skills to make those decisions. We've got to create the expectations and the accountability systems so that then we can have people at the institution, at the appropriate institutional planning level, making those decisions. That's my expectation.

Colleges also utilized cross-functional teams for budget alignment and for innovating: "We've tried to create that innovation throughout the organization…it's faculty, it's student services, it's administrators, and it's putting together cross-functional teams to allow that to happen."

Training was frequently emphasized as "key" to student success efforts that required everyone to "step it up":

> Professional development is key. People have got to get the skills [for] a more sophisticated management and academic environment. The skill sets change. You've got to have a very robust professional development effort that's aligned to your mission. I can't see us managing change well without having a much, much more robust professional development part, and building all our skill sets…all of us will have to step it up a little bit more in this environment.

Colleges described training programs that included visits to observe best practices at peer institutions, extensive data workshops, targeted training in pedagogical techniques and new delivery formats such as co-requisite instruction, and leadership training.

Discussion

The findings for research questions one and two resulted in the substantive grounded theory *Seeking Alignment: Managing Change to Increase Student Success.* The theory describes how community college leaders are managing change as they transition from a traditional mission centered on access to a 21st century mission focused equally on student success. The processes of transition described by participants reflected many aspects of organizational learning and decision-making theory. This section discusses the relationship of the findings to the literature on organizational learning and decision making.

Organizational learning. Argyris and Schon (1978) defined organizational learning as the "detection and correction of error" (p. 2). Elements of organizational learning, as described in the literature, were evident in leaders' efforts to align campus culture, processes and programs to a student success agenda. While all leaders described situations and actions reflecting organizational learning, learning occurred differently at different colleges. Furthermore, within the framework of student success, college leaders decided where and how they focused their alignment efforts. Benbya and McKelvey (2006) described alignment as a journey rather than a state, an "incremental process of continual improvement to achieve specific alignment goals" (Bosua & Venkitachalam,

2013, p. 333). Leaders repeatedly described the continuous improvement cycles they engaged to increase student success.

Examples of single-loop and double-loop learning were also observed. Single-loop learning involves responding to discrepancies in expectations and outcomes by modifying a process until the desired outcome is achieved, but without altering the foundational values and structures that underlie the process (Argyris, 1976). In contrast, double-loop learning is a transformational change where organizations "unlearn previous behaviors, and…develop new cognitive frameworks" to address their challenges (Lawson & Ventriss, 1992, p. 207). Both types of learning occurred at participants' institutions. For example, early student success efforts often reflected single-loop learning around individual initiatives. In contrast, colleges implementing guided pathways embraced a new student success paradigm - an example of double-loop learning.

Part Two findings, and the proposed substantive theory, included many examples of organizational learning established in the literature:

- Learning occurred by seeking information internally through experience, and externally from peers, professional organizations, and best practices (Levitt & March, 1988).
- Leaders responded to internal and external pressures and events that prompted a need for change, and impacted their alignment efforts (Perrott, 2008).
- Institutions embraced new approaches to student success as they learned and processed new information (Huber, 1991).

- Colleges were concerned with legitimacy, participating in national student success networks and committing to student success priorities (J. W. Meyer & Rowan, 1977).
- The three mechanisms of diffusion proposed by DiMaggio and Powell (1983) were evident: mimetic isomorphism (colleges looked to peers and best practices for potential solutions), coercive isomorphism (colleges responded to state and federal mandates, and to accreditation demands), and normative isomorphism (colleges embraced social justice as a central tenet in their decision-making process).
- Inadequate databases and software hindered student success efforts; colleges struggled with what Meyer (2002) described as a traditional practice of "muddle through" (p. 541).
- Evaluation planning for student success initiatives ranged from vague (lacking clear definitions and timelines) to precise (clearly defined by metrics and timelines), reflecting different organizational learning trajectories and goals (Lawson & Ventriss, 1992).
- Resource allocation processes varied at different institutions, and many struggled with terminating established, but less effective, programs (Crossen, Lane, & White, 1999). Resource allocation is important in organizational learning; it can define a decision and reflect a "specific commitment to action" (Mintzberg, Raisinghani, & Theoret, 1976, p. 246). Colleges were working to define and refine their resource allocation processes.

- Colleges worked to institutionalize new processes, programs, and procedures as a way of storing knowledge and transitioning to a student success mission (March, 1991).
- Leaders acknowledged elements of campus culture that influenced student success efforts, such as resistance, fear of change, lack of engagement, and preference for traditional ways of doing things (Schein, 1996).
- Two types of change were described by leaders: (1) generative change facilitated by ongoing learning and a continuous improvement cycle; and, more rarely, (2) proactive change pursued prior to a crisis (Kezar, 2005).

In each case, organizational learning began with a change in perception or understanding, and progressed to changes in specific actions. Friedlander (1983) maintained that learning does not always result in behavioral change, that a change in understanding itself was evidence of learning. However, leaders interviewed for this study pursued organizational learning primarily to inform behavioral, structural, and procedural changes at their institutions. While such changes began with a change in understanding, they ultimately - and intentionally - led to specific actions designed to increase alignment to student success priorities.

Decision making. Efforts to increase alignment involved decision making. Aspects of decision making described in the organizational learning literature also emerged in the data, particularly in the strategy of Programming. Programming was a balance between *exploitation* and *exploration* (March, 1991). Interventions were exploited (maintained or expanded) when results met or exceeded institutional

expectations. This was seen, for example, in the institutionalization of successful pilots and the expansion of internally proposed experimental programs. In contrast, when student outcomes were poor, institutions explored, searching for new solutions.

However, as both time and resources were limited for college leaders, programming efforts were vulnerable to satisficing (March, 1994). March described satisficing as more of a search rule than a decision rule, triggered by gaps between expectations and performance. The time and resources devoted to searching varied at different institutions. Mentoring by national networks also influenced searching.

Institutions were also susceptible to competency traps. A competency trap occurs when success with an initiative results in its continued use, absent exploration of alternatives that might result in even more favorable outcomes (Herriott, Levinthal, & March, 1985). Levitt and March (1988) commented that "success is the enemy of experimentation" (p. 334). However, for colleges with limited time and resources, pursuing what works - a process Gigerenzer and Selten (2002) labeled "constrained optimization" - was a frequent choice. Constrained optimization occurs when leaders select an option from those available at the time, either discontinuing the further search for options or deciding not to search at all (Gigerenzer & Selten, 2002). Early entrants into the student success arena relied on experimentation during the first decade of the 21st century; participants in this study often described it as "throwing spaghetti on the wall and seeing what sticks." As colleges gained experience with initiatives, they established a culture of student success on their campuses, often narrowing consideration of new initiatives to those that supported what they were already doing.

The introduction of guided pathways is an example of modern exploration; mature institutions, experienced with individual student success initiatives, experimenting with a promising new practice (Jenkins et al., 2019). Exploration involves risk, as the "returns are uncertain, distant, and often negative" (March, 1991, p. 85). Implementation of guided pathways can trigger an initial decrease in enrollment, with a reduction in institutional revenues. One participant from Part One of this study noted that:

> …in the short run colleges are losing their shirts by doing the right thing….you have to make this investment at a time when states are cutting and enrollments are down, and initially you'll probably see a dip in enrollments. Like a couple of presidents said, it's costly but it's the right thing to do for students.

Although the risk involved in guided pathways reflects exploration, it is a practice based on research and one that combines elements of practices already demonstrated to be effective, such as extensive student services and limited curricular choices. As such, colleges employ both strategies - exploration and exploitation - when they pursue guided pathways.

An unexpected finding was the frequent absence of program/initiative evaluation, as well as vague evaluation processes that failed to clearly define metrics or an evaluation plan. Exploitation is pursued when program returns are "positive, proximate, and predictable", while exploration is "experimentation with new alternatives" when program returns fall below expectations (March, 1991, p. 85). In the absence of evaluation there are no measured returns to inform strategy decisions, miring colleges in a nonproductive limbo where resources invested in an unevaluated program qualify as neither exploitation nor exploration.

Summary

The main concern of community college leaders interviewed for this study was Increasing Student Success. They worked to increase student success by Seeking Alignment of college culture, programs, and processes to a new mission that prioritizes student success. The strategies they used to seek alignment were Programming, Resourcing, and Leading. Their success in implementing these strategies was impacted by their ability to Manage Change. Furthermore, their ability to manage change was influenced by three factors: Change Capacity - ability to change, Change Pressures - external pressure to change, and Change Values - inclination to change. Managing change was critical as they worked to transition from old ways to new ways, from a mission of access to a mission of access and student success. Importantly, their ability to manage change also influenced the degree of alignment sought and the degree of alignment achieved.

This section of Chapter Five introduced the grounded theory *Seeking Alignment: Managing Change to Increase Student Success,* and presented and discussed the findings for research questions one and two. The next section will present and discuss the findings for research question three.

Findings and Discussion for Research Question Three

The findings for research questions are presented as (a) restatement of the question, (b) findings, (c) discussion, and (d) summary.

Restatement of the Question

Research question three: How do community college leaders perceive cost-effectiveness analysis (CEA) and its potential role in promoting efficiency and effectiveness in student success programs at their institution?

Findings

As described in Chapter 2, CEA is a cost analysis tool that compares two alternative programs in terms of both effectiveness and efficiency - discerning for college leadership which program will provide the greatest improvement in student outcomes for the lowest cost, and allowing leaders to maximize the effectiveness of their spending. Prior to the interview, study participants were provided with a brief description of CEA, and a summary of Levin and Garcia's (2012) findings demonstrating the cost-effectiveness of the City University of New York's (CUNY) Accelerated Study in Associate Programs (ASAP). Interview questions addressing research question three were included at the end of the interview for research questions one and two, which lasted between 20 and 90 minutes. Depending on the remaining time available, most participants were asked: (a) how they defined and pursued efficiency, and (b) how they perceived CEA, which included whether or not they were familiar with CEA prior to the interview, and if they felt CEA would be useful at their institution. In addition, many participants described how they would use CEA - current and future decisions they felt could be informed by CEA. The findings for research question three are presented in sections corresponding to these interview questions.

Defining and pursuing efficiency. When leaders were asked to define efficiency at their institution, responses included:

- "effective utilization of resources…resources used for the benefit of student outcomes";
- "doing the right thing and getting to the right outcomes and outputs…in a manner that is considerate of measures like workflow measures";
- "doing the right thing, in the right way"; and
- [no] fluff in the expenses, or any ancillary expenses that can't really be justified.

Several mentioned the negative connotations that accompany the term *efficiency* in higher education. While they did work to maximize efficiencies in many areas, they acknowledged: "We don't talk efficiency very much in higher education. And that kind of shuts things down, depending on who your audience is."

No one addressed linking spending to outcomes, or analyzing whether or not funds were allocated in the most effective way possible. Such analysis has not traditionally been part of the student success conversation in higher education. Furthermore, it is not required or demanded by granting agencies, governing boards, or legislatures. Community college leaders, with extensive demands placed on their time and resources in other areas, were not including such analyses in their decision-making process.

Participants reported regularly pursuing efficiency in college operations and course delivery. However, efficiencies in the selection and implementation of initiatives were seldom if ever considered. When asked if their institution calculated efficiency metrics such as cost per transfer student, cost per successful course completion, or cost

per graduate - the answer was no. Colleges were using cost data to calculate costs per student, such as instructional costs per FTE, but did not consider the cost to produce a successful outcome. Furthermore, colleges did not use costs in a comparative way; they did not consider the cost effectiveness of alternative programs used to achieve the same outcomes, such as a traditional curriculum versus an experimental curriculum.

Areas where colleges did use cost data included cost feasibility of initiatives, and academic program review. Colleges usually, but not always, considered cost feasibility before implementing new student success programs. However, they also stated that cost was not a deterrent in considering or implementing programs they believed would benefit students. Another area where costs were considered was in academic programs. Many institutions already required, or were in the process of requiring, return on investment calculations as part of the academic program review process, where return on investment was measured in terms of revenue generation.

Perceptions of CEA. Most study participants had not heard of CEA prior to the interview. They commented that they were unfamiliar with it, had not seen it presented at conferences, and were not aware of discussions on cost-effectiveness analysis at the state or national level. A few were aware of CEA, particularly leaders with a background in economics, finance, or statistics. Many others were familiar with CUNY's ASAP, but not with the Levin and Garcia (2012) study that demonstrated ASAP's cost effectiveness. Leader were asked about their perception of CEA and whether or not they felt it would add value to their decision making. As mentioned above, many also commented on how

they would use it. Furthermore, many discussed why they would use it in current and anticipated events impacted by financial considerations, pressures, and expectations.

Would they use CEA? After learning more about CEA, what it can do, and its potential use in decision making, leaders' comments included:

- "Wonderful, that's fantastic."
- "That would be phenomenal, phenomenal."
- "Wow, that's impressive."
- "That's really exciting."

When asked if CEA would be useful to their institution, individual responses included:

- "It definitely would be."
- "I think that's incredibly useful."
- "I would love to have a tool like that….I think people would be ecstatic to have something like that".
- "Absolutely, absolutely."
- "It would be incredibly valuable as an institution."
- "It's very timely for this organization right now. I think it would be extraordinarily helpful."
- "If it's a tool, I'm always interested in new ways of taking a look at things. I'd be interested in seeing [it], I think a lot of people would."
- "Yes…we're always looking for ways to improve, so yes, that would be something of interest."

- "I'm really interested in this."
- "I can definitely see this being valuable."

Some leaders expressed interest in CEA, but questioned whether or not it would change their decision making. A vice president pondered "Would it change how we do things? I don't know. It might, it might change." Concerns regarding CEA's usefulness in decision making centered around ethics, and the social justice mission of community colleges. In these instances, leaders perceived CEA as a tool that prioritized financial considerations over student needs. One leader noted that many programs that are not cost effective are important to the college mission:

> There are times where some things we do make absolutely no cost sense at all, they just don't. They're not cost effective whatsoever, and that's okay, it's still part of our mission and what we need to do because it's the right thing to do.

Another observed that CEA may not change what they do because costs are seldom a deterrent:

> We want to show that everything we do is effective in some manner. What I never actually thought about was possibly allowing costs to be a deterrent. So [CEA] may or may not produce for us. Even if it does, I don't know that that would deter me. I would have to figure out what else isn't a priority if I feel strongly that this is what we still must do.

And another described the preeminence of social justice in their decision making:

> …the students that [we're] trying to help are the tip of the spear when it comes to the mission of a community college. If the mission of the community college is the democratization of education for students who have been underserved by those kinds of opportunities in the past…and you can show some benefit, even though it [is not cost effective]….I think this is probably the reason that these kinds of calculation aren't readily done.…When you begin talking about social justice needs, and the ways in which programs work to respond to those kinds of things, you've changed the conversation a little bit.

How CEA might be used. Leaders often described specific situations at their institution where CEA would have been, or could be, helpful. Advising programs, developmental education initiatives, student outreach efforts, and in-house versus outsourcing were among those mentioned. A vice president involved in course redesign described how he would use CEA in evaluating instructional delivery modes: "…so here are a set of classes using this type of instruction versus a set of classes that are using the old traditional type of instruction. Which is most effective in terms of both cost and student outcomes?"

In addition to the value CEA adds in comparing alternative programs to determine which is most cost-effective, leaders mentioned the insights CEA would add in understanding why and how a program is working or not working. For example, one leader commented:

> One of the things that I would ask is I'd look at it from the standpoint of "why did it cost twice as much?" Is there a way that we could get the same outcome by reconfiguring the processes and operation that led to the cost? That's what I would do. I would take the thing that costs twice as much and ask why.

Additional potential uses for CEA mentioned by leaders included:

- Budget requests: "to help make the pitch."
- Explaining reallocation plans to faculty: "to have a tool that would help faculty and department chairs and deans see the big picture [of] how can we reallocate the way we are spending these dollars and in a little more focused initiative."
- Justifying programs: "to sell program[s] internally and externally."

- Program implementation: Comparing program implementation on different campuses of a multi-campus district.
- Creating a strategic financial mindset: "It's very useful to go through that exercise, in terms of understanding, because…the people who manage finances in a college are oftentimes more along the lines of having training as accountants, not as financial strategists."

Importantly, a president noted the benefits of peer comparisons, and the value of asking questions about cost-effectiveness:

> We have a lot of conversations lately on three-year graduation rates, six-year graduation rates, our transfer rates, and so I think that [CEA] would be really helpful for us. And especially if we had some comparison groups of similar sized institutions that when we look at it gives us the opportunity to drill down and have conversations with some other institutions that might be performing better in certain areas, and see what they are doing differently that we might be able to adopt….If you don't know what those costs are, or what those comparisons or differences are, you'll never ask the question.

Current and anticipated need for CEA. College leaders described two factors they felt contributed to the need for CEA: gaps in current practice, and anticipated future pressures.

Gaps in current practice. Gaps in current practice, mentioned by leaders, comprised gaps in processes and gaps in serving students. In processes, one president observed that traditional budgeting approaches were inadequate for current demands. The data provided by CEA would inform the resource allocation process. In addition to budgeting processes, many leaders discussed gaps in the planning and evaluation process

used to select and evaluate student success interventions. A vice president described what was missing from their planning and evaluation process:

> It [CEA] really should be embedded in everything that we do; that we're really evaluating the cost-benefit of initiatives or even programs and activities that we set out to do. And that doesn't always happen....[We need to ask] is it really moving the needle? And are we doing some post review and thorough planning up front, and then on the back end? Are we making the difference that we thought we were going to make?

Another wanted to know if student success resources were being allocated effectively, something their current practices did not reveal: "Beyond that is after the resources have been allocated, and then we implement, there needs to be that next feedback loop - how did it work?" CEA answers these questions.

In relation to serving students, leaders noted opportunities to reduce student costs and to do a better job of providing successful initiatives to support student success. A researcher observed:

> [Community colleges] are efficient if you look at cost per student; they're extremely inefficient when you look at cost per graduate. So in the economic sense of cost per completion, which is what you want to reduce for the benefit of students and their families, and for taxpayers, they're inefficient.

Additionally, a former vice president noted the gaps in student success created by the absence of cost analysis:

> I do think that there are a lot of things that we, community colleges, undertake without really knowing the cost-effectiveness and we do it for the sake of kind of an ethical stance - "this is the right thing to do." But we don't necessarily know the cost, and for me, it's the right thing to do, but you can only really say that securely if you costed out the alternatives that might achieve the same end. I don't see a whole lot of that.

Anticipated future pressures. Future pressures that leaders anticipated included:

- Funding constraints: "…we can't just keep saying yes to every single initiative….if we knew what worked, and we knew what worked well, then we could better reallocate our resources to better utilize them."
- Greater demands for financial accountability from legislators and governing boards: "…we're seeing an increased focus on accountability and performance-based funding, those sorts of things, so I think it's going to get increasingly important to make sure that we're able to articulate the success versus costs of whatever we're doing."
- Greater demands for financial accountability from granting agencies and philanthropic foundations: "A lot of things that [K-12] tried…crashed and burned. I'm pretty sure [grantmaking agencies] don't want the same thing to happen in higher education….higher education is understanding that, or at least their philanthropic community is understanding that."
- Potential loss of autonomy: "[Financial accountability] is the next big thing and…we [need to] stay ahead of it, and help contribute to how we define that." They went on to caution that "if we're not careful we're going to have...[the definition] being given to us….We don't want it to be given to us…because we're not a business."

Discussion

CEA has not been widely used in higher education, and few studies exist. Historically, cost analysis beyond cost feasibility and ROI is seldom considered in decision making. As such, CEA currently lies outside the cognitive frames of most

community college leaders. Bensimon (2005), in her discussion of equity gaps in higher education, described cognitive frames as the "mental maps" individuals use to interpret and respond to situations (p. 100). She further explained that "understanding cognitive frames is important because at the same time that frames make some things visible, they also function as cognitive blinders in that whatever is out of the frame may be imperceptible" (p. 101). As such CEA is, or has been, imperceptible to most college leaders.

Growing interest in CEA is changing these cognitive frames. In 2012, the Center for Benefit-Cost Studies of Education completed an economic evaluation demonstrating the cost-effectiveness of CUNY's ASAP (Levin & Garcia, 2012). MDRC is currently evaluating ASAP replication efforts in Ohio community colleges, including cost-effectiveness (https://www.mdrc.org/project/Evaluating-Replications-of-CUNY-ASAP#overview). And in July 2019, the CCRC began a project to estimate the costs of implementing guided pathways; the project includes combining cost data with effectiveness data to estimate the cost-effectiveness of guided pathways (https://ccrc.tc.columbia.edu/research-project/cost-guided-pathways-whole-college-reform.html).

Competency traps may also affect CEA use in community colleges. Traditionally, colleges have used measures of program effectiveness to guide decision making. Many colleges have seen improvements in graduation rates, course completions, and other parameters of student success by utilizing only effectiveness data (www.achievingthedream.org). As such, they may not consider alternative methods of

program evaluation, such as CEA. Argyris (1991) asserted that individuals "must learn how the very way they go about defining and solving problems can be a source of the problems in its own right" (p. 1). If increasing student success is the main concern of community college leaders, the suboptimal use of resources that may occur when decisions are based on effectiveness data alone can be considered part of the problem:

> The fact of the matter is that momentous decisions are made every day as to the allocation of resources to one or another competing purpose, and that, particularly in noncommercial organizations, the decisions are made in almost complete absence of the evidence which would be necessary to validate them. (Simon & Barnard, 1945, p. 265)

Meyer (2002) described the different pressures educational organizations face in stable versus volatile environments. Generous funding in the 20th century allowed colleges to expand programs, in contrast to the resource constraints of the 21st century that require institutions to more clearly define their purpose and priorities. Meyer observed that higher education institutions "must rapidly improve their ability to position themselves pro-actively in more…turbulent environments….they must adopt new organizational structures and practices and overcome one-sided mental models of an earlier period" (p. 535). Institutional efforts to meet demands for increased student success, despite limited resources, will be facilitated by considering both effectiveness data and cost data together.

Resistance to cost analysis may arise from concerns that efficiency is misplaced in higher education; this perspective was expressed by some participants. Efficiency in business is defined by profits; efficiency in non-profits, including higher education, requires a broader definition (Simon & Barnard, 1945). Dart (2004) described non-profit

organizations redefining efficiency in a social justice framework when affected by resource scarcity; as one non-profit administrator observed "if the revenue isn't there, then the service isn't available" (p. 298).

Summary

In summary, the findings for research question three suggested that community college leaders are not aware of CEA, or the benefits inherent in using CEA. However, when the potential contributions of CEA to decision making were described, they expressed interest in learning more about it, and frequently expressed a desire to use it. They also described how CEA could help colleges respond to current and future expectations, including increased demands for both student success and financial accountability.

Chapter Summary

Chapter Five presented the findings for research questions one, two, and three. The findings for research questions one and two were described in the grounded theory that emerged from the data - *Seeking Alignment: Managing Change to Increase Student Success*. The findings for research question three indicated that community colleges leaders are not aware of CEA and its benefits, but recognize the potential value it adds to decision making. Chapter Six is the final chapter of the study. It presents an overview of the study, summarizes the findings from Part One and Part Two, suggests recommendations for future research and practice, describes the relationship between Part One and Part Two, and discusses the significance of the study.

Chapter Six: Discussion

This study explored the potential use of cost-effectiveness analysis (CEA) by individual community colleges, how college leaders work to increase student success, and how CEA might fit into their student success efforts. Chapter One introduced the study. Chapter Two reviewed the literature. Chapter Three described the methodology. Chapters Four and Five presented the findings for Part One and Part Two. This chapter summarizes the study, discusses the findings, and presents conclusions.

The discussion is organized in five sections. First, an overview of the study is presented. Secondly, Part One and Part Two are considered individually; the purpose, research questions, methodology, findings, limitations/delimitations, and recommendations are presented for each. Next, the significance of the study is discussed. Lastly, the relationship between Part One and Part Two, and implications for the future, are considered in the conclusion.

Overview

Community colleges in the 21st century are being asked to do more with less - to serve increasingly at-risk and underprepared students, to improve transfer and completion rates, and to do both without a substantial increase in resources. Despite these challenges, CEA - a cost analysis tool that allows colleges to maximize program effectiveness within financial constraints - is not used in higher education. The community college sector focuses primarily on measuring program effects, an important variable in student success. However, without also measuring program costs, an equally important variable is

missing. If colleges leaders do not know the cost of a successful outcome, they cannot evaluate the effectiveness of their spending. Without evaluating the effectiveness of their spending, they cannot know if they are providing their students with the best programs possible with the resources available.

CEA helps to fill this void. CEA is strictly comparative; it evaluates alternative programs, combining cost data with effectiveness data to reveal which program provides the greatest benefit at the lowest cost. There are no decision rules surrounding CEA; the decision maker must balance the added insights of cost analysis with other institutional priorities. Many leaders expressed concern that decisions guided by cost analysis would conflict with their equity and social justice mission. It is critical that CEA not be used mechanistically; as one component of the decision-making process it contributes to, but does not determine, a decision outcome. Less cost-effective programs may be preferred if they reach a challenging demographic or impact previously underserved students. When such considerations are preeminent, there is little value in doing CEA. Alternatively, CEA can be used specifically to identify the most cost-effective programs for reducing achievement gaps, allowing cost analysis to serve and enhance equity efforts.

Cost-feasibility is an additional consideration. The most cost-effective program may also be more expensive. In such cases, cost-feasibility may supersede cost-effectiveness as the determining factor in program considerations.

However, in the absence of extenuating circumstances, CEA adds value to the decision-making process by highlighting financial consequences that might otherwise be obscured, and by guiding the allocation of resources to maximize spending effectiveness.

For example, in 2007 The City University of New York (CUNY) launched the Accelerated Study in Associate Programs (ASAP) to provide wrap-around services and academic supports to students at CUNY's community colleges. The goal of ASAP was to increase the three-year graduation rate from 25% to at least 50%. While ASAP was more expensive than the traditional approach, CEA demonstrated that it was cost-effective, increasing graduation rates at a savings of over $6,000 per ASAP graduate (Levin & Garcia, 2012). When community college leaders use CEA to select the most cost-effective programs, they maximize the value of their investments while honoring their commitment to student success.

Part One

Purpose of the Study

The purpose of Part One was to explore the potential implementation of CEA by individual community colleges. To date, CEA studies have been done primarily by external researchers, including the Center for Benefit-Cost Studies of Education, MDRC, and the Community College Research Center, using the methodology outlined in *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017). Part One explored the feasibility of simplifying and adapting the methodology described by Levin et al. (2017) for use by individual colleges for internal decision making. It investigated what is required for colleges to carry out a CEA study, challenges that might arise, and potential solutions to the challenges.

Research Questions

1. What is required for CEA to be implemented at community colleges.

2. What challenges exist at community colleges for the implementation and use of CEA?
3. How can these challenges be addressed?

Methodology

Part One was an investigative study. There are few published studies of CEA in community colleges, and no studies were found on the practical aspects of implementing CEA at the institutional level. Therefore, an exploratory approach was taken to understand the potential use of CEA by colleges, and its potential role in internal decision making. Data collection occurred through purposive sampling with individuals who had expertise in CEA, institutional research, and data analytics. Eleven individuals participated in the study. In addition, when applicable, data from Part Two was included.

Summary of Findings

The findings for Part One suggest that CEA can be done by individual colleges. Simplification of the methodology presented in *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* (Levin et al., 2017) is possible, allowing it to be adapted for use by community colleges. Utilization of the adapted methodology is appropriate for internal decision making. Part One identified the resources and competencies colleges will need to use CEA, as well as potential challenges. Potential solutions for each challenge were also identified.

Two unexpected findings emerged in Part One. First, colleges did not always articulate a theory of change prior to implementing a student success initiative. In the absence of a theory of change, colleges adopted best practices based on national or peer

recommendations rather than how practices fit into their vision for student success. Secondly, colleges frequently did not plan for program evaluation prior to implementing an intervention, and did not always evaluate results after implementation. When evaluation planning was considered, success metrics were often *fuzzy* - vaguely acknowledged as what a college hoped would happen. This was unanticipated as colleges participating in the study were members of national student success networks that advocate a *culture of evidence* (Gonzalez, 2009; Levin & Garcia, 2012; Rincones-Gomez, 2009). Establishing a theory of change and evaluating intervention effectiveness are both necessary components of CEA.

Limitations

CEA is not commonly used in higher education, and only a few published studies exist. This limited the number of possible participants with expertise and experience in CEA. CEA is commonly used in healthcare research and practice (Hummel-Rossi & Ashdown, 2002). Healthcare researchers may have added valuable insights to the study of CEA methodology and application. However, due to time constraints, healthcare researchers were not included in the sample. The small sample size of national student success network advisors was also due to time constraints.

Recommendations

Recommendation for future research. As mentioned, there are few extant CEA studies of community college programs. The long history of CEA use in healthcare facilitated the establishment of CEA healthcare databases, and refined CEA practice through the experiences and recommendations of many researchers (Hummel-Rossi &

Ashdown, 2002). CEA in higher education is in the nascent stage; additional studies will add valuable practical and theoretical information to the field of postsecondary cost analysis, policy, and strategic finance. Ross, Barkaoui, & Scott (2007) commented that "the lack of attention to cost considerations impedes the development of a knowledge base of what works in education, which impedes educational policy formation" (p. 2).

Several community college leaders interviewed in Part Two expressed interest not only in using CEA at their institution, but in comparing their CEA outcomes with those of peer institutions. The unique populations and characteristics of each college, and what will likely be non-standardized implementation of CEA methodology at individual colleges, may preclude a community college CEA database. However, sharing and publication of institutional CEA results could help community colleges identify strengths and weaknesses in their own programs, and avenues for improvement. Recommendations for future research include:

- Implement an ex ante or ex post CEA at a community college using only internal personnel and resources, assess the challenges and outcomes, and evaluate if and how the study impacted decision making.
- Explore how IR capacity at community colleges - including staffing, expertise, internal and external demands, and software and database challenges - affects student success efforts.
- Explore how CEA might fit into program evaluation and decision making at colleges using a guided pathways model.

- Explore faculty or administrative perceptions of *efficiency*, and the potential role of efficiency in student success efforts.
- Explore awareness of CEA among governing board members and legislators, and their perceptions of the usefulness of CEA in promoting student success.

Recommendations for future practice. For colleges interested in using CEA, recommendations for practice include:

- CEA requires a measure of program effectiveness, expressed as a single effectiveness metric. Prior to implementing an initiative, clearly define student success metrics, how they will be measured, and an evaluation timeline.
- Articulate a theory of change for each new student success proposal.
- Assess the evaluation status of existing programs and develop a process for new program proposals that includes an evaluation plan.
- Modify financial records and databases to disaggregate costs. Record the costs of individual program components.
- Consider expanding IR office capacity. If new staff are added, consider adding staff with expertise in evaluation and data analytics.
- Do a CEA study. Chapter Four described the adaptations colleges can make to simplify the process, and still obtain valid and useful results. These adaptations are also presented in Appendix C.

Part Two

Purpose of the Study

Part Two used a grounded theory approach, initially seeking to understand how community college leaders use program cost data in decision making: (a) how they connect spending to outcomes, and (b) how they pursue efficiency and effectiveness in student success efforts. Part Two also sought to understand how leaders perceive CEA, and its potential use at their institution. In grounded theory methodology, the original research questions often evolve in response to the data. This occurred in Part Two. As interview data were collected it became apparent that cost data were used only peripherally in decision-making. Program costs were seldom considered outside of cost feasibility, and strategic finance was limited primarily to budgeting processes. The purpose of the study evolved into understanding how college leaders worked to resolve their main concern - increasing student success, and where and how CEA might fit into their efforts.

Research Questions

The original research questions were:

1. How do community college leaders perceive - and if applicable, assess - the link between institutional spending and student success?
2. How do community college leaders perceive and pursue efficiency and effectiveness in student success programs?
3. How do community college leaders perceive cost-effectiveness analysis (CEA) and its potential role in promoting efficiency and effectiveness in student success programs at their institution?

Methodology

Data were gathered through unstructured and semi-structured interviews with community college leaders at institutions currently or previously active in national student success networks. Twenty-six leaders participated in the study, representing 14 colleges in six states. Interviews were done in person and by phone, were recorded and transcribed, then coded by hand and with MAXQDA software.

Summary of Findings

Research questions one and two. Upon beginning the study, it was anticipated that program costs would be a main concern for college leaders. Instead, increasing student success was their main concern. Grounded theory seeks to explain how participants resolve their main concern. The substantive grounded theory that emerged from the data was *Seeking Alignment: Managing Change to Increase Student Success*. It describes how college leaders work to improve student success by seeking greater alignment of campus culture, processes, and programs to a student success mission.

Managing Change emerged as a property of Seeking Alignment. Due to the evolution of the community college mission, leaders were managing change as they transitioned their institutions from *old ways* focused on increasing access to *new ways* focused on increasing student success. Three factors influenced their ability to manage change:

- Change Capacity - resources and limitations, both internal and external, that affected the *ability* to change;
- Change Pressures - external forces, such as mandates and expectations, that imposed *pressures* for change; and

- Change Values - aspects of campus history and culture that influenced the *inclination* to change.

While leaders chose different approaches to Seeking Alignment, three common strategies emerged - Programming, Resourcing, and Leading. Within each strategy, however, execution varied. Less precise execution involved actions and processes that were vague, unstructured, and based on anecdotal evidence; while more precise execution appeared as well defined, structured, and data informed.

Research question three. The findings revealed that most college leaders were not aware of CEA or the value it adds to decision making, and were not using efficiency metrics such as cost per course completion or cost per graduate. As mentioned previously, some leaders expressed concern that discussion of costs would distract from a focus on student success and social justice. However, during the interviews all expressed openness toward learning more about CEA, and potential interest in using it. They described past projects where decisions would have been informed by CEA; current projects where CEA could provide valuable perspectives; and future situations, such as reduced funding and greater demands for financial accountability, where CEA would be helpful. They also acknowledged challenges in implementing CEA, such as faculty resistance to a perceived emphasis on efficiency, and facilitating collaboration between multiple offices.

Limitations/Delimitations

Study limitations included participants' lack of awareness of CEA, which might have affected their responses to questions about CEA. To address this, participants were

provided with a brief description of CEA prior to the interview. Participants in this study were community college executive leaders; their time was limited. Interviews ranged from 20 to 90 minutes and, due to leaders' demanding schedules, it was not possible to schedule a second interview or return with follow-up questions. Sample size was also limited by researcher time and resources.

Delimitations included sample selection and delimiting that occurred as the theory emerged. Sample selection was limited to executive leadership - Chancellors, Vice Chancellors, Presidents, and Vice Presidents. Mid-level managers may have different concerns and may consider program costs differently. In addition, only colleges that were, or had been, members of national student success networks were included. A different theory may have emerged from colleges less mature in their student success efforts.

Delimitation also occurred progressively as an inherent part of grounded theory methodology. Initial coding produced an extensive list of categories. As the theory emerged, the participants' main concern was identified and a core category, describing how participants address their main concern, was selected. Further research was delimited to the categories that were relevant to the theory. In addition, once saturation occurred, no further data were collected.

Recommendations

- Improve evaluation planning. The grounded theory that emerged in Part Two revealed inconsistencies in community college program evaluation planning and procedures. Part One also revealed gaps in this area; a theory of change was

seldom articulated prior to selecting and implementing student success initiatives. Program evaluation informs decision making, guides student success efforts, and supports the use of CEA.

- Foster a strategic financial mindset. Cost feasibility, and return-on-investment measured in revenue generation, were often considered in student success program decisions. However, in terms of effectiveness, only student outcomes were examined; no attention was focused on the effectiveness of institutional spending. If the cost of producing a unit of output is unknown, it is very difficult to assess the effectiveness of the spending required to achieve that output. Inclusion of cost data in decision making facilitates evaluating the effectiveness of institutional investments in student success.

Significance of the Study

Despite stakeholder demands for improved student outcomes without an increase in institutional resources, community college leaders do not have the tools they need to maximize the effectiveness of institutional investments in student success. CEA is a tool, accessible to community colleges, that helps to fill this void. This study contributes to community college practice by identifying resources and competencies that colleges need to implement CEA on their own, as well as identifying potential challenges and potential solutions. It identifies a niche for CEA in current and future practice, framed by a substantive theory describing how college leaders work to increase student success.

This study also contributes to the student success literature. There are no published studies that evaluate the potential use of CEA in community colleges - what is

required, challenges that may arise, and potential solutions to those challenges; or that explore college leaders' perceptions of CEA and its role in decision making. As such, this study adds to the literature on community college productivity and efficiency. It is hoped that this study will increase awareness of CEA, encourage greater use of a strategic financial mindset in the community college sector, and contribute to increased student success in community colleges.

Conclusions

The grounded theory that emerged from Part Two, *Seeking Alignment: Managing Change to Increase Student Success*, describes how college leaders manage change as they seek to align campus culture, processes, and programs to a student success mission. The additional concept of frontiers was not included in the theory, but described in Chapter Five. Frontiers lie just beyond the limits of institutional knowledge, experience and capacity. As colleges gain new knowledge, experience, and capacity, their frontiers advance.

The concept of a frontier allows expansion of the theory to include how leaders may manage change in the future, and provides a space for CEA. Advancing frontiers open opportunities for new actions and new approaches in pursuing student success. CEA is currently outside the cognitive frames of most community college leaders. The publication of new CEA studies, such as those currently evaluating guided pathways and the Ohio ASAP replication efforts, may advance awareness of CEA and the value it adds to decision making. In addition, increased demands for financial accountability from public stakeholders may prompt a greater focus on strategic finance in the community

college sector. Frontiers expanded by new knowledge and new pressures identify a niche for CEA that has always existed, but seldom been recognized, explored, or exploited. As a cost analysis tool that supports colleges in maximizing the effectiveness of their spending and offering students the greatest chance for success, CEA is a timely and critical asset for decision making in 21st century community colleges.

Appendices

Appendix A: Sample Cost Template

Ingredient name	Description, notes, and assumptions	Ingredient quantity	Price per ingredient	Cost
Personnel				
Facilities				
Materials and Equipment				
Other				
Total Cost				
Number of Participants				
Average Cost per Participant				

Appendix A. Adapted from *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* by Levin et. al, 2017, p. 105. Copyright 2018 by SAGE Publications, Inc.

Appendix B: Sample Cost Template Across Stakeholders

Ingredients	Total Costs	Cost to the College	Cost to Partners	Cost to Grant-making Agency
Personnel				
Facilities				
Materials and Equipment				
Other				
Total Cost				

Appendix B. Adapted from *Economic Evaluation in Education: Cost-Effectiveness and Benefit-Cost Analysis* by Levin et. al, 2017, p. 118. Copyright 2018 by SAGE Publications, Inc.

Appendix C: CEA Adapted Checklist

Column I: "Template Checklist for Appraising Economic Evaluations", reproduced from *Economic Evaluation in Education: Cost-Effectiveness Analysis and Benefit-Cost Analysis*, by Levin et. al., 2017, pp. 270-272.

Column II: Adapted checklist for use by community colleges for initial CEA implementations. Adaptations (variations from Column I) are italicized.

Column I	**Column II**
Template Checklist for Appraising Economic Evaluations	**Adapted Checklist for CEA use in Community Colleges**

A. Establishing the decision framework	**a. Establishing the decision framework**
A.1 Does the study carefully define a problem?	a.1 Does the study carefully define a problem?
A.2 Does the study delineate the alternatives under consideration?	a.2 Does the study delineate the alternatives under consideration?
A.3 Do the alternatives correspond with their corresponding theories of change?	a.3 Do the alternatives correspond with their corresponding theories of change?
A.4 Do the alternatives represent the most feasible options for the decisionmakers?	a.4 Do the alternatives represent the most feasible options for the decision makers?
A.5 Is the audience and perspective clearly specified and justified?	a.5 *Is the audience clearly specified?*
A.6 What is the analytical technique designated to choose among the alternatives (cost-effectiveness [CE], cost-utility [CU], or benefit-cost [BC]? Is this form of analysis justified in relation to the theory of change?	*Omitted - CEA is used*
A.7 Is the time horizon for the evaluation specified?	a.6 Is the time horizon for the evaluation specified?

B. Calculating costs	**b. Calculating costs**
B.1 Is the sampling frame for the cost analysis reported?	*Not applicable for beginning use of CEA considering only one site*
B.2 Are all ingredients for each alternative described in detail, along with their sources?	b.1 Are all ingredients for each alternative described in detail, along with their sources?
B.3 Are ingredient quantities and prices considered separately in the calculation of cost?	b.2 Are ingredient quantities and prices considered separately in the calculation of cost?
B.4 Is the study clear on whether expected/national costs or site-specific/local costs are being calculated?	*b.3 Are all sources for institutional prices and local cost estimates identified and noted?*
B.5 Are costs expressed in constant dollars and discounted into present values?	*Not applicable for short-term interventions; actual cost data can be used for internal decision making.*
B.6 Are total costs and average costs for the intervention reported? Are these costs incremental to an alternative intervention or business as usual? Is the denominator for the average cost per student or school listed and justified?	*b.4 Are total costs and average costs for the intervention reported? Are these costs incremental to an alternative intervention or business as usual?*
B.7 Are induced costs estimated?	*Not applicable for initial attempts at CEA.*
B.8 Is there an analysis of the distribution of cost burdens among constituencies?	*b.5 If relevant to the framework selected by the college, is there an analysis of the distribution of cost burdens among stakeholders?*
B.9 Is the cost analysis differentiated for different scales of alternatives?	*b.6 Are differences in scale noted and considered?*
B.10 Does the cost analysis correspond to an effectiveness estimate? Are limitations of the correspondence between costs and effects discussed?	*b.7 Does the cost analysis correspond to an effectiveness estimate?*

C. Evaluating effects, utility, or benefits	***c. Evaluating effects***
C.1 Is the measure of effectiveness appropriate? Does it neglect important outcomes of the alternatives that should be taken into consideration?	*c.1 Is the effectiveness metric selected appropriate?*
C.2 When multiple effects are combined, is the CU method clearly described?	*Not applicable*
C.3 Are the measures of effectiveness identified using rigorous methods?	*c.2 Is the measure of effectiveness identified with descriptive statistics(acceptable for internal decision making) or rigorous methods?*
C.4 What methods are used to translate impacts into benefits? Are these methods valid?	*Not applicable*
C.5 Are all benefits - positive or negative - counted over the life of the intervention?	*Not applicable*
C.6 Are benefits expressed as present values to correspond with costs?	*Not applicable*
C.7 Is there an adequate analysis of distributional effects and benefits of the alternatives across different groups?	*Not applicable*

D. Combining costs and outcomes	**d. Combining costs and outcomes**
D.1 Is the information on costs and effects used to calculate CE ratios? Are these results used correctly to rank alternatives? Does this analysis appropriately include limitations presented in the presentation of costs and effects?	d.1 Is the information on costs and effects used to calculate CE ratios? Are these results used correctly to rank alternatives? *Limitations omitted*
D.2 In the case of a CU study, are CU ratios calculated and interpreted?	*Not applicable*
D.3 Are costs and benefits used to calculate BC ratios, net present values (NPVs), and internal rates of return (IRRs)? Is the perspective for each metric clearly stated?	*Not applicable*
D.4 Are economic metrics reported precisely or with ranges of confident intervals?	*Not applicable*
D.5 Is a sensitivity analysis included? Is the choice of sensitivity analysis appropriate?	*d.2 Is sensitivity analysis included? Is the method of sensitivity analysis explained?*

E. Explaining the results	**e. Explaining the results**
E.1 Are the results explained in a way that decisionmakers can understand and apply them?	e.1 Are the results explained in a way that decisionmakers can understand and apply them?
E.2 Are the differences in estimates among the alternatives large enough that you would have confidence in using them as a basis for decisions?	e.2 Are the differences in estimates among the alternatives large enough that you would have confidence in using them as a basis for decisions?
E.3 How generalizable are the results to other decision contexts?	*Not applicable*

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